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WILLIAM HENRY BROWN

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ONE PLATE

William Henry Brown, botanist and last American director of the Bureau of Science, died quite unexpectedly November 9, 1939, in Baltimore, Maryland, following a heart attack. He was fifty-five years old. Doctor Brown will be missed by his colleagues and associates at the Bureau of Science during his long tenure of office. In the sudden death of this prominent botanist, the scientific world sustained a great loss. He came to the Bureau of Science in 1911 as a plant physiologist; he retired from the Bureau in 1933, after 22 years of distinguished service, as one of the foremost authorities on Philippine flora. As administrator of the Bureau of Science he achieved notable success.

Doctor Brown was born in Richmond, Virginia, October 6, 1884. He received his Bachelor of Science degree from Richmond College in 1906 and his Doctor of Philosophy from Johns Hopkins University in 1910. Before coming to the Philippines he was scientific assistant at the United States Laboratory in Beaufort, North Carolina; student assistant, graduate assistant, fellow, and later Bruce fellow of Johns Hopkins; he engaged in botanical investigations in Jamaica in 1910; he was assistant of the Desert Laboratory of Carnegie Institution and of the Michigan Agricultural Experiment Station, then instructor in plant physiology at the Michigan Agricultural College.

In 1911, one year after he received his doctor's degree from Johns Hopkins University, Doctor Brown joined the Bureau of Science as plant physiologist. He brought to bear upon his duties a ripe experience as a botanist, obtained both in temperate and in tropical regions. In 1914 he was appointed assistant,

Section of Botany, and in 1915, botanist. From 1915 to 1924 he was associate professor, professor, and head of the Department of Botany of the University of the Philippines. At the time of his appointment as Director of Science he was professor of botany and acting head of the Department of Botany of the College of Liberal Arts, University of the Philippines. In 1925, after a year of discharging the numerous responsibilities of both positions, he found it difficult to give as much time as he should to the running of the Department of Botany, and it was with considerable regret that he asked to be released as acting head of this Department. He served as chief of the Division of Investigation of the Bureau of Forestry from 1919 to 1920. In 1921 he transferred again to the Bureau of Science as botanist. He became Director of Science in 1924, holding this important post until his retirement, November 30, 1933. The records of these various positions show that Doctor Brown was constantly in demand for advice and instruction. Johns Hopkins called him back in 1938, to be a lecturer in botany and to take charge of the botanical laboratory and garden.

Doctor Brown's reputation as a botanist was based mainly on his studies of Philippine vegetation. One has but to read the list of his publications to find that from 1911 to 1938, his time was devoted almost entirely to the study of Philippine plants and forests. He listed and described hundreds of plants. He wrote 53 papers and books, besides his administration reports. Ecology, morphology, physiology, and economic botany are his forte. His works appear principally in the Philippine Journal of Science, the Philippine Bureau of Forestry bulletins, and the Botanical Gazette. Scientists and students will connect his name with: Vegetation of Philippine mountains, Minor Products of the Philippine Forests, The Plant Kingdom, A Textbook of Botany, Laboratory Manual of Botany, and General Science for Philippine schools. Many of his works are used as textbooks in the schools throughout the Philippines, at the University of the Philippines, and abroad.

His publications are enduring monuments to their author. Of his "Textbook of General Botany" and "Laboratory Botany," Franklin P. Metcalf, Professor of Botany at Lingnan University, Canton, China, said in 1925: "He has a treatment quite different from the average run of botany textbooks . . . next year I may try it as I do not believe in always using the same textbook. His book has excellent figures and almost all are new ones. His figures in themselves make an excellent book." When it was

first published professors in the Universities of Illinois and Queensland planned to use it as the textbook to teach elementary botany. These are indications that the books have been written from a general rather than from a local point of view. They are suitable to any climate or region.

November 27, 1933, a contract was entered into between the Philippine Government and Doctor Brown to the effect that he would deliver to the Philippine Government a book dealing with Philippine botany which he was then preparing in consideration of the sum of 7,280 pesos.[1] The result is his monographic work on the useful plants of the Philippines, which was still in the process of editing when he died. This work of three volumes deals with individual species, or, in a few cases, of individual genera. It is profusely illustrated, containing 457 drawings of over a thousand figures, which will enhance its value to the public and to scientists. After complying with the terms of the contract, Doctor Brown used his time freely in revising and improving the manuscript. There had been considerable delay in connection with minor matters of putting the finishing touches on the illustrations and of bringing the manuscript up-to-date. On it, Doctor Brown did much work during the last five years of his life. He believed that this book would be of great value to the Philippine Government, and that this was the only means by which he could make available to the public the considerable store of information that he, as a botanist, had gathered at government expense during his twenty-two years of service. This monograph will be a monument to Doctor Brown, and his greatest achievement in science in the Philippines. Professor H. H. Bartlett, exchange professor to the University of the Philippines from the University of Michigan, and Chairman of the technical committee to look into the status of and report on Doctor Brown's manuscript on Useful Plants of the Philippines, said: "I am convinced that the work in question is extremely valuable from the standpoint of public instruction."

The Bureau of Science under Doctor Brown's administration maintained the high position it had attained among the leading scientific institutions of the world. Although administrative duties prevented him from devoting his whole time to scientific research, it was during this period that his valuable and practical publications were published.

Doctor Brown believed that the Bureau of Science, with its Scientific Library, offers an excellent place for training real

[1] One peso equals 50 cents United States currency.

scientists. As a scientist and an administrator, Doctor Brown had for one of his most important objectives the training of competent and promising Filipino personnel for the Bureau. He made special efforts to obtain fellowships abroad for members of distinct ability in the Bureau. He searched for men of special aptitudes for the various lines of work carried on by the Bureau of Science. Doctor Brown and Doctor E. D. Merrill were able to secure the services of Doctor Eduardo Quisumbing, one of the foremost Filipino systematic botanists. Doctor Marcos Tubangui, an outstanding parasitologist and protozoölogist, and Doctor Salvador del Mundo, a brilliant chemist, were among the "promising materials" spotted by Doctor Brown.

Immediately upon his assumption of the directorship of the Bureau of Science, Doctor Brown planned a building program. The activities of the Bureau were increasing so greatly that the work was seriously hampered by the crowded condition in the laboratories. He realized the absolute necessity of extensions to the building if the efficiency of the service was to be maintained. The library and the botanical and entomological collections were so crowded that it was exceedingly difficult to consult them. He had a vision of extensions of the Bureau of Science towards the Philippine General Hospital. A part of his plan was realized when the old animal house was converted into eight well-equipped laboratory rooms in 1925 and when the west wing was completed in 1931. During his administration the cement laboratory, the Cebu laboratory, and the fishponds were constructed; the tikitiki plant, the testing and assay laboratories, and the Alabang serum laboratory, were extended and improved; and additional bookstacks were installed in the Scientific Library.

A high tribute was paid to Doctor Brown when the Philippine Research Institute made him its first president. The Institute was a private nonstock corporation organized in 1929 "to conduct, encourage, promote and foster scientific research in the Philippines." At that time there was no institution in the Philippines primarily interested in pure research. Aware of the almost unlimited possibilities for profitable scientific investigation in the Philippines, the Institute aimed to make use of the favorable situation of the Philippines as a center of tropical research. The Institute hoped that more systematic and larger efforts along research lines may be developed, and that Filipinos may be given more incentive along lines of research.

The incorporators of the Institute were encouraged to believe that they could obtain coöperation and financial backing here

and in the United States. The Government agreed to furnish quarters and general facilities for the work of the Institute. It prepared a program of research over a period of five years. Several fellowships were already in sight then.

Although the Institute was short-lived, the idea that animated it still lives in the National Research Council of the Philippines.

The Philippine Journal of Science loses a valued contributor in Doctor Brown, who served as associate editor from 1912 to 1924 and as editor-in-chief from 1924 until his retirement as director of science.

Doctor Brown was an active member of various societies covering the scientific and botanical fields here and abroad. The defunct Philippine Research Institute elected him its president in 1929. He was a fellow of the American Association for the Advancement of Science and a member of the Botanical Society of America, the Ecological Society of America, the American Meteorological Society, Phi Gamma Delta, Gamma Alpha, and Phi Beta Kappa. He was given a complimentary ten-year membership in the Source research council, Incorporated, of Chicago, Illinois, 1928–1938. He acted as consultant on questions on botany and other sciences in the Philippines. He served at various times on several important committees of the National Research Council of the Philippines and other scientific societies. During the mining boom of 1936 and 1938, he served as director of the San Mauricio Mining Company and of Marsman and Company, Incorporated. He was a Mason and a member of the Universiy Club, Rotary Club, Manila Polo Club, and the Elks Club.

His wife, Mary Angus Blythe, and two sons survive him.

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ILLUSTRATION

PLATE 1. WILLIAM HENRY BROWN

PLATE 1. WILLIAM HENRY BROWN

THE INCIDENCE OF PLASMODIUM AND HÆMOPROTEUS INFECTIONS IN SOME PHILIPPINE BIRDS

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The existence of natural *Plasmodium* and *Hæmoproteus* infections in birds is a matter of common knowledge. Investigations along this line have been undertaken by Huff,(2) who recorded *Plasmodium* infections in 79 species of birds and estimated about twice as many *Hæmoproteus* infections. In the Philippines, Hegner and Chu(1) found three *Plasmodium* and seven *Hæmoproteus* infections in 95 birds belonging to 47 species. In 1932 Russell(3) published a survey of *Plasmodium* and *Hæmoproteus* infections in birds of Luzon, and of 604 blood smears from 46 species of birds, 10 per cent were positive for *Plasmodium*, 19 per cent for *Hæmoproteus*, and 18 per cent for mixed infection of *Plasmodium* and *Hæmoproteus*. Although the result of Russell's survey gives a fairly good estimate of the percentage of *Plasmodium* and *Hæmoproteus* infections with regard to the 604 birds taken as a whole, it is quite insignificant when we take the individual species of birds into consideration, because in most of the species studied by him, only 1 or 2 birds were examined. We believe that in the determination of the incidence of infection in a species of birds a more accurate result can be obtained if a greater number of birds belonging to a given species is examined.

In connection with our work on avian malaria, we had opportunity to examine a considerable number of birds belonging to 3 species; namely, *Padda oryzivora*, commonly known as Java sparrow (*mayang costa*); *Munia jagori*, the Philippine weaver (*mayang pula*); and *Excalfactoria lineata*, the Island painted quail (*pugó*). We also examined a number of domestic doves, *Columba livia*, and canaries, *Serinus canarius*. Our Java sparrows and Philippine weavers were bought from peddlers who caught them in the provinces around Manila during 1938 and 1939. The island painted quails were bought from Pampanga, Rizal, and Surigao Provinces during July, August, and Sep-

tember, 1938. We presume that the infection in the birds found positive was natural, because these birds were caught in the wild state and were examined immediately after they were bought. The domestic doves were bought from market vendors who raised them in the suburbs of Manila, while the canaries were bought from Chinese dealers who imported them from China. The blood was examined by making thin smears and staining them with modified Giemsa stain, after which they were viewed under the oil-immersion objective.

RESULTS

The results of our investigation with regard to the 4 species of Philippine birds studied are shown in Table 1. Thirty-two canaries were examined, and all were found negative for *Plasmodia or Hæmoproteus.* Morphologically the *Plasmodia* found in the 3 species apparently belong either to *Plasmodium præcox* or to *P. circumflexum.* The infection with *P. circumflexum,* however, was found only in 2 Java sparrows, *Padda oryzivora,* the rest of the infection being that of *P. præcox.* The *Hæmoproteus* observed in our birds is morphologically similar to *Hæmoproteus columbæ* Celli and Sanfelice, 1891(4).

TABLE 1.—*Incidence of parasites in birds examined.*

Species.	Number examined.	*Plasmodium.*		*Hæmoproteus.*		Mixed infection.	
		Number positive.	Per cent positive.	Number positive.	Per cent positive.	Number positive.	Per cent positive.
Padda oryzivora	264	12	4.5	0	0	0	0
Munia jagori	232	16	6.8	0	0	0	0
Excalfactoria lineata	200	6	3.0	84	42	5	2.5
Columba livia	32	0	0	26	81.2	0	0
Total	728	34	4.6	110	15.1	5	0.6

SUMMARY

The results of the examination of the blood smears of more than 700 Philippine birds, belonging to 4 species, and a number of imported canaries, *Serinus canarius,* are reported. Morphologically the parasites found apparently belong to the species *Plasmodium præcox, P. circumflexum,* and *Hæmoproteus columbæ* Celli and Sanfelice, 1891.

ACKNOWLEDGMENTS

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CHIRONOMOIDEA FROM JAPAN (DIPTERA), XII[1]

NEW OR LITTLE-KNOWN CERATOPOGONIDÆ AND CHIRONOMIDÆ

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FOUR PLATES

Most of the midges discussed in this paper were collected in Formosa by Dr. R. Takahashi and by myself. A rather extensive collection from Hokkaido and southern Sakhalin was sent to me by Mr. M. Akizuki. A few scattered specimens from various parts of Honsyu and Kyusyu were collected by Messrs. Y. Yoshimura, Y. Ito, K. Shibuya, and by myself. All the specimens described at this time are preserved in our entomological laboratory. I wish to express my very deepest thanks to the above-mentioned entomologists for their cordial cooperation in this study of the chironomid midges of Japan.

The term 'antennal ratio' is used to express the length of the distal elongated segments of the antenna in relation to the remaining proximal short segments of the flagellum. The leg ratio is the length of the first tarsal segment in relation to the length of the tibia. The proportional lengths of the segments of the leg are used to express the relative lengths of the segments from the femur to the last tarsal segment. The method of description employed and the terms adopted in the text are the same as those used by myself in a number of recent papers.

CERATOPOGONIDÆ

CULICOIDES UNGUIS sp. nov.

Female.—Body about 2 mm long. Thorax black, slightly shiny. Eyes very finely pubescent. Wings without colored markings, with macrotrichia only along extreme tip. Legs with claws equal, long, longer than fourth tarsal segment (4:3).

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[1] Contribution from the entomological laboratory of Kyoto Imperial University, No. 89. The series of papers on the "Chironomidæ from Japan" is continued henceforth under the title "Chironomoidea from Japan."

Proboscis short, about half vertical length of head. Antennæ dark brown, with segments three to nine spherical, following five segments oval or cylindrical; antennal ratio about 1. Legs brown; third tarsal segment somewhat flattened; fourth segment obcordate; fifth segment cylindrical; claws simple and unusually long. Proportional lengths of segments of hind leg about 38 : 37 : 16 : 7 : 4 : 3 : 6. Wings (Plate 4, fig. 87) with macrotrichia along distal margin, without colored markings. Venation: second radial cell larger than first, fMCu under r-m; microtrichia present; radial veins brown. Halteres white. Abdomen black.

Holotype.—Female; Simogamo, Kyoto; August 8, 1931.

Paratopotypes.—Females; August 8, 1931.

This species is very distinctive in the possession of finely pubescent eyes and the long tarsal claws.

ALLUAUDOMYIA QUINQUEPUNCTATA sp. nov.

Female.—Body about 1.5 mm long. Thorax bicolorous: tergal side and dorsal half of either pleural side pure white, external side and ventral half of either pleural side brown. Wings with thick macrotrichia on distal third; radial cell only one, owing to absence of R_{2+3}; five small black spots distinct.

Head brown, with a white spot on vertex. Eyes bare, just contiguous at dorsal side. Antenna with scapes yellow, flagellar segments white; antennal ratio about 0.88; proportional lengths of distal eight segments as follows: 16 : 5 : 16 : 16 : 19 : 21 : 23 : 24.5 : 30. Mouth parts brown; maxillary palpi white; third palpal segment not swollen; ultimate palpal segments slightly clavate. Thorax bicolorous, dorsal half pure white, ventral half brown; scutum setigerous, slightly shiny, without scutal spine; scutellum with a pair of long median and a pair of small lateral setæ. Legs bicolorous; coxæ and trochanters all brown; femora brown, in fore- and hind legs each with a white preapical ring and in middle leg white on distal half except dark distal end; fore tibia dark brown at both ends, broadly brown at middle, and with a white subbasal and preapical ring; middle tibia similar to fore tibia but middle brown ring very small and situated at distal fourth; hind tibia also similar to fore tibia but basal end entirely white; tarsal segments almost entirely white; only first segment of hind leg brown. Femora slender, without spines; tarsi without spurlike bristles; fourth tarsal segments of all legs flat, obcordate; fifth tarsal segments elongated, clavate, without strong ventral bristles; claws simple, very unequal; longer claw almost as long as fifth tarsal segment and shorter claws about three-fifths length of longer claw. Relative

lengths of segments 23 : 23 : 9 : 5 : 2 : 2 : 5 in foreleg; 32.5 : 29.5 : 15.5 : 6 : 2.5 : 2.2 : 5 in middle leg; and 26 : 27.5 : 11 : 4.5 : 3 : 2 : 4.5 in hind leg. Wings (Plate 2, fig. 19) with macrotrichia thick, distributed on distal third, veins colorless and hyaline, marginal fringe of setæ very long; radial cell only one; squama and alula bare; five dark spots distinct. Halteres white. Abdomen white.

Holotype.—Female; Kibune, Kyoto; June 1, 1930.

This species is characterized by the bicolorous thorax, the marking of the wings, the venation of the radial branches, and the distribution of the wing macrotrichia.

ALLUAUDOMYIA UNDECIMPUNCTATA sp. nov.

Male.—Body about 1.5 mm long. Mesothoracic scutum yellowish brown with brown clouds. Wing with eleven dark spots.

Antennæ yellowish white; antennal ratio about 0.87; proportional lengths of distal six segments about 10 : 10 : 17 : 27 : 32 : 33. Thoracic scutum yellowish brown, with two brown stripes along foveæ and two transverse brown clouds on either side; scutellum yellow; postscutellum and sternal and pleural sides extensively brown. Legs with coxæ and trochanters brown; yellowish brown on basal half, brown on distal half, and each with a yellowish-white preapical ring; tibiæ brown, each with a yellowish-white subbasal and preapical ring; tarsi all white. Proportional lengths of segments of forelegs about 20 : 18 : 9 : 4 : 2 : 1.7 : 3; of hind legs, about 20 : 20 : 10 : 4 : 2 : 1.7 : 3. Wings (Plate 2, fig. 20) dark brown basally, with eleven distinct dark spots. Venation: first radial cell slitlike, second radial cell small and obscure; macrotrichia on distal margin of cells R_5, M_1, and M_2. Halteres white. Abdomen white; hypopygium brown.

Holotype.—Male; Kitasirakawa, Kyoto; May 13, 1933.

This species is distinguished from the other known species of the genus by the coloration of the thoracic scutum and by the wings.

ALLUAUDOMYIA SAGAENSIS sp. nov.

Female.—Body only 1.4 mm long, yellow in ground color. Mesoscutum brown, with numerous yellow spots. Wings with many dark-blue spots; macrotrichia sparse, spread on distal area. Legs with dark rings before and beyond knee joints; femora and tibiæ broadly dark at middle.

Antennæ with scapes yellow, elongated distal segments pale brown, short basal flagellar segments white on basal half and pale brown on distal half; antennal ratio about 1; ultimate segment tapering on distal third, with a preapical seta. Meso-

scutum with numerous yellow spots; scutellum brown, with a pair of yellow clouds; postscutellum brown; pleural and sternal sides extensively yellow; pleuron with a brown stripe arising from cervix ending at abdominal basis. Legs with coxæ yellow; trochanters brownish black; knee joints yellow; femora yellow on basal and apical parts, broadly dark at middle, each with a dark preapical ring; tibiæ yellow on basal and preapical parts, broadly dark at middle, narrowly dark on apical end, each with a dark ring on proximal part; tarsal segments white; third tarsal segment cordiform; fourth tarsal segment distinctly cordiform; fifth segment elongated, clavate; claws simple, very unequal; tarsal spines, pulvilli, and empodia all absent; proportional lengths of legs 20 : 19 : 7.5 : 3 :5 : 1.7 : 1.5 : 5 in foreleg; 22 : 22 : 10 : 3.2 : 2 : 2 : 2 : 4.5 in hind leg. Wings (Plate 2, fig. 21) with many dark-blue spots; macrotrichia scanty, spread only on distal area; radial cell only one, owing to absence of R_{2+3}. Halteres yellow. Abdomen pale brownish yellow on tergal side; cerci yellow.

Holotype.—Female; Saga, Kyoto; August 18, 1937.

This species is distinguished from all other known species of *Alluaudomyia* by the coloration of the mesoscutum, legs, and wings.

MONOHELEA (MONOHELEA) TESSELLATA Zetterstedt.

Female.—Body about 2.8 mm long. Thoracic sclerites almost entirely brown, scutum with one pair of humeral, two pairs of lateral, and one pair of claudoscutal yellow spots, with numerous dark dots; scutellum with four long setæ and a median yellow spot. Wings with elaborate dark markings. Antennal ratio about 1.1. Legs yellowish brown, with dark-brown markings; tarsal segments with spurlike bristles; claws of hind leg unequal in length.

Eyes bare, contiguous to each other above; frontal aspect of head yellowish brown; mouth parts yellow. Antennæ with scapes and basal half of short flagellar segments yellow, distal half of short flagellar segments and all elongated distal segments brown. Legs with coxæ and trochanters brown; femora of fore- and middle legs yellowish brown, those of hind legs brown and very strong; all femora broadly dark at tip; tibiæ of fore and middle legs brown, those of hind legs dark brown and very thick; tarsi of fore- and middle legs pale yellow, those of hind legs yellowish brown; claws of fore- and middle legs equal in length, each with a basal tooth; those of hind legs

unequal in length (14:5), without basal tooth; proportional lengths of segments of hind leg as follows: 74:73:25:13:8:10:9. Wings (Plate 2, fig. 22) with veins brown, and with distinct dark markings; proportional lengths of first and second radial cells about 19:36, M_2 atrophied basally. Abdomen with dorsal side yellowish pale brown, ventral side yellowish brown on anterior segments and brown on posterior segments, lateral sides black due to dark subcutaneous pigment.

Specimen.—Female; Toyohara, Sakhalin; August 5, 1933.

CERATOPOGON (TRISHELEA) INCOMPLETA Kieffer.

Male.—Body about 1.5 mm long. Head and thorax entirely reddish brown. Wings with main veins yellowish white. Halteres white. Legs with tarsi white, other segments yellowish brown. Abdomen dark brown.

Antennæ brown; antennal ratio about 0.75; proportional lengths of distal five segments about 9:9:32:20:24. Wings with radial cells distinct and very short; second cell shorter than first; r-m almost as long as R_{4+5}; fMCu under base of radial branches; M_2 completely absent. Hypopygium with styles (Plate 4, fig. 94) curved only at tip, bluntly swollen mesad at middle.

Specimen.—Male; Wati, Kyoto; May 17, 1936.

CERATOPOGON (TRISHELEA) ABDOMINALIS sp. nov.

This minute midge was collected from caves along the seashore.

Female.—Body only 1.3 mm long, almost entirely brown. Mesoscutum slightly shiny. Wings with two distinct radial cells, M_2 completely atrophied; macrotrichia very sparsely arranged in a line closely along distal margin of cells R_5 and M_1. Abdomen white on anterior three segments, brown on other posterior segments, and dark on lateral sides.

Head brown. Antennæ mainly white, with scapes brown; segments two to nine spherical, ten to fourteen oval, subequal in length to each other; antennal ratio about 1. Legs almost entirely white, coxæ brown; fourth tarsal segments of all legs flat; claws slightly unequal, each with a minute sharp tooth at base; proportional lengths of segments 21:22:8:4:2.5:2:3.5 in forelegs; 27:24:11:5:5:3.5:2.3:4 in hind leg. Wings (Plate 1, fig. 12) with veins colorless; two radial cells distinct. Halteres white. Abdomen white on anterior segments, brown on posterior segments, with lateral sides dark.

Holotype.—Female; Takasiba, Wakayama-ken; April 10, 1934.

Paratopotypes.—Female; April 10, 1934.

This species is distinctive in the distribution of macrotrichia of the wing and in the characteristic coloration of the abdomen.

CERATOPOGON (ISOHELEA) MINIMUS Kieffer.

This minute midge was found on the flowers of umbelliferous plants.

Female.—Body 1.1 mm long, black in general color. Mesothoracic scutum mat, with black setæ. Halteres with knobs white. Leg with coxæ, trochanters, and femora dark brown; tibiæ and tarsi yellowish white. Wings each with a small, dark, central cloud covering distal part of radial vein; two radial cells absent.

Head dark, eyes pubescent; frontoclypeus with only two pairs of small setæ. Antennæ with scapes and setæ black; flagellar segments pale brown; antennal ratio about 1.1. Maxillary palpi (Plate 3, fig. 49) pale brown; segment three with a large sensory pore, sensillæ of the pore not visible externally. Legs with relative length of segments 80:84:30:18:11:8:15 in foreleg; 95:92:47:22:13:9:15 in middle leg; 95:85:45:18:13:9:15 in hind leg; claws long, slender, arcuated, each with two basal trichoid teeth; empodium vestigial. Wings (Plate 1, fig. 15) hyaline, each with a dark central cloud covering radial end. Abdomen extensively yellow; tergal plates small, black; sternal plates highly reduced into very small paired sclerites which are brown on anterior five segments and black on remaining segments; cerci pale brown.

Specimens.—Female; Kamikoti, Nagano-ken; July 13, 1932.

CERATOPOGON (ISOHELEA) FLAVIVENTRIS Kieffer.

This is a minute midge, only 1 mm long.

Male.—Head and thorax dark brown. Halteres white. Wings with veins pale brown, two radial cells obliterated. Twelfth antennal segment longer than ultimate segment. Antennæ, mouth parts, and legs pale brownish yellow.

Antennal ratio about 0.8; proportional lengths of distal three segments 22:5:17:21. Legs with fourth tarsal segments cylindrical; hind legs with proportional lengths of segments 15:15:7.8:4:2.8:2:2.4. Wings (Plate 1, fig. 14) with radial cells obliterated; fMCu under base of first radial cell. Abdomen almost entirely pale brown; posterior segments including hypopygium dark brown.

Specimens.—Male; Sizyukei, Formosa; December 29, 1934.

CERATOPOGON (ISOHELEA) FALCIFER sp. nov.

Male.—Body about 1.5 mm long, almost entirely black. Thorax black, shiny. Wings white, with squama bare and dark; two radial cells subequal in length, very short; R_1 subequal to r-m. Halteres dark. Abdomen also black. Hypopygium with sickle-shaped styles.

Head with eyes pubescent. Antennæ including plumose hairs dark; antennal ratio about 0.83; proportional lengths of distal six segments 14 : 13 : 13.5 : 41 : 28 : 33. Legs black, with second and third tarsal segments somewhat paler; claws simple, curved only at extreme tip; pulvilli absent; empodium small; proportional lengths of segments of hind leg 24 : 22 : 10 : 6.5 : 4 : 2.5 : 2.7. Wings white, with main veins pale brown. Venation: costa ending just beyond middle of wing, radial cells equally very short, R_1 subequal to r-m, fMCu under base of second radial cell, M_2 atrophied on basal third or more. Abdomen dark; hypopygium with large, flat, anal points; coxites thick, subspherical; styles (Plate 3, fig. 45) large, sicklelike, angulated on distal third, bare and pointed on distal half.

Holotype.—Male; Toyohara, Sakhalin; July 31, 1938.

This species is very characteristic in the structure of the male style and the very short radial branches, in which it differs notably from other known species of the subgenus.

CERATOPOGON (ISOHELEA) ALBITARSIS sp. nov.

Female.—Body about 1.4 mm long, extensively dark brown. Wings with radial cells brown; first radial cell small; second radial cell obliterated; M_2 atrophied narrowly only on basal part. Claws slightly unequal, each with a sharp basal tooth.

Head and thorax dark brown. Antennæ with scapes dark brown; flagellum brown; segments two to four spherical, following five segments short and cylindrical, ultimate five segments elongated and cylindrical; antennal ratio about 1.22. Thoracic notum slightly shiny; scutellum with only four setæ. Legs with coxæ, trochanters, femora, and tibiæ dark brown, proximal four tarsal segments white but pale brown at tip, first tarsal segment of hind leg brown, fifth tarsal segments pale brown; relative lengths of segments of foreleg 20 : 19 : 7 : 3 : 2.3 : 1.8 : 3.8; those of hind leg 23 : 21 : 11 : 3.5 : 2.7 : 2 : 4. Wings (Plate 1, fig. 13) with radial cells brown; first radial cell small but distinct; second cell obscure; M_2 atrophied narrowly on basal part; r-m comparatively long, as long as R_1. Halteres dark brown. Abdomen with tergal side yellowish pale brown.

Holotype.—Female; Kibune, Kyoto; July 10, 1932.
Paratopotypes.—Females; July 10, 1932.

This species is somewhat related to *C. flaviventris* Kieffer, but distinctly different in the coloration of the legs, halteres, and wing veins, and in the shape of the radial cells.

CERATOPOGON (ISOHELEA) MONTICOLUS sp. nov.

This species was collected on the flowers of umbelliferous plants.

Male.—Body about 1 to 1.2 mm long. Mesothoracic scutum brown, slightly shiny with two lateral vittæ reddish brown; humeral pits small and yellow. Wings without first radial cell, second radial cell small but distinct; R_1 and R_{4+5} completely fused, forming a long stem of second radial cell; R_{4+5} ending somewhat squarely, a faint, small, brown cloud covering second radial cell.

Head with frontal tubercles before antennal bases; eyes pubescent with minute hairs. Antennæ pale brownish white, with scapes brown; proportional lengths of distal nine segments 8: 8.5: 8.5: 9: 9: 9: 29: 22: 29; antennal ratio 1.26 to 1.53. Maxillary palpi (Plate 3, fig. 48) pale yellowish white; segment three with a sensory pore consisting of short spoonlike sensillæ. Thorax extensively brown, with setæ yellow; scutum slightly shiny, with humeral pits yellow, lateral vittæ reddish brown; membranous areas pale brown. Legs mainly yellowish white, with coxæ brown, femora yellowish pale brown; claws simple; empodium small, with two apical setæ; proportional lengths of segments 24: 24: 11: 5: 3: 2: 4 in foreleg; 26: 26: 12: 5: 3: 2: 4 in middle leg; 26: 24: 10: 5: 3: 3: 2: 4 in hind leg. Wing (Plate 1, fig. 16) with a faint, small, brown cloud covering second radial cell; veins mainly yellow; second radial cell small but distinct, and with a long stem formed by fusion of R_1 and R_{4+5}; M_2 atrophied on proximal and distal parts. Halteres white. Abdomen white on anterior four or five segments and brown on other segments; hypopygium yellowish brown, styles (Plate 3, fig. 50) slender, slightly arcuated, bare on apical third; slender, each with a single seta at tip.

Holotype.—Male; Tokugo-toge, Nagano-ken; July 18, 1932.
Paratopotypes.—Males; July 18, 1932.

This species is related to *C. minimus* Kieffer, but the vein R_{4+5} ends squarely and the second radial cell is clearly different from those in related species. Another allied species may be *C. sociabilis* Goetghebuer, in which, however, the wing is provided with two distinct radial cells.

CERATOPOGON (ISOHELEA) BASIFLAGELLATUS sp. nov.

This species is very minute, being only 0.8 to 0.9 mm in the male and 0.7 to 0.8 in the female. Both sexes were found on the flowers of umbelliferous plants.

Male.—Thorax entirely reddish brown, mat, with hairs yellow. Wings with two distinct radial cells.

Head reddish brown; mouth parts and antennal flagellar segments yellowish white. Spoonlike sensillæ of sensory pore of maxillary palpus invisible externally. Antennal ratio about 0.63; proportional lengths of distal six antennal segments about 8 : 8 : 7 : 25 : 21 : 26. Legs with coxæ reddish brown, trochanters, femora, and tibiæ brown, tarsi white; proportional lengths of tarsal segments of foreleg 38 : 23 : 17 : 10 : 12; those of hind leg 48 : 23 : 18 : 9 : 13. Halteres brown on stem, white on knob. Wings (Plate 2, fig. 18) with two radial cells distinct, veins yellow. Abdominal terga of anterior five segments yellowish brown, those of other segments brown; hypopygium brown; styles (Plate 3, fig. 47) almost straight, slightly curved only at distal end, bare on distal tip.

Female.—Thoracic sclerites yellowish brown, membranous areas yellow; scutum slightly shiny; scutellum with only four setæ. Antennæ with scapes yellowish brown, other segments yellowish white. Wings without M_2, two radial cells slitlike.

Head without frontal tubercles, eyes very finely pubescent. Antennæ 14-segmented, last segmentation incomplete; proportional lengths of distal seven antennal segments 6 : 6 : 8 : 9 : 12 : 10 : 11; antennal ratio about 1.1. Maxillary palpi each with a sensory pore consisting of several spoonlike sensillæ. Legs with coxæ yellowish brown, femora yellow, tibiæ pale yellow, tarsi white; claws very slightly unequal; proportional lengths of tarsal segments of forelegs 25 : 13 : 11 : 8 : 14; of hind legs 38 : 15 : 12 : 9 : 15. Wings (Plate 2, fig. 17) with two slitlike radial cells, M_2 completely atrophied. Halteres as in male.

Holotype.—Male; Hokugo-toge, Nagano-ken; July 18, 1932.

Allotopotype.—Female; July 18, 1932.

Paratopotypes.—Male and females; July 18, 1932.

This species is somewhat related to *C. sociabilis* Goetghebuer, in which, however, the wing of the female is provided with vein M_2.

ATRICHOPOGON (ATRICHOPOGON) MINIMUS Kieffer.

Female.—Body length 1.3 to 1.4 mm. Head dark brown. Thorax brown; scutum brown or black, more or less shiny, with shoulder parts white, three vittæ brown and confluent; scutellum

yellow. Antennal ratio about 1.6. Wing with macrotrichia very sparse, spread only on distal end of cells R_5 and M_1; relative lengths of first and second radial cells 6.5: 16, those of R_1 and R_{4+5} 7.5: 22.

Head dark brown on vertex, whitish brown on frontal aspect. Antennæ brown; segments two to nine discoidal or spherical; segment ten fully as long as preceding two segments taken together; relative lengths of five distal elongated segments 21: 23: 25: 25: 38. Thoracic sclerites extensively brown; pleural and sternal sclerites yellowish brown. Legs with coxæ brown, other segments yellowish pale brown; proportional lengths of segments of hind leg 28: 26: 15: 5: 4: 3: 4. Wings (Plate 1, fig. 1) with macrotrichia very sparse, spread only on distal end. Halteres pale brown, yellow, or white. Abdomen pale brown or brown.

Specimens.—Females; Kagi and Sizyukei, Formosa; December 28 and 29, 1934.

ATRICHOPOGON (ATRICHOPOGON) FEMORALIS sp. nov.

Female.—Body about 2.2 mm long. Thoracic notum including scutellum uniformly black, shiny; pleural and sternal sclerites dark brown. Femora of forelegs entirely yellow; those of middle and hind legs broadly black at middle and yellow on both ends. Antennal ratio about 2. Wings with macrotrichia very thick; bare areas along veins M_{3+4}, Cu_1, Cu_2, and 1A distinct; relative lengths of first and second radial cells 8: 27.

Head entirely dark brown, mouth parts brown; eyes bare. Antennæ with spaces and basal half of segment two yellow, other parts of antennæ dark brown; segments two to nine spherical or subspherical, segments ten to fourteen elongated, cylindrical; segment ten shorter than preceding three segments put together (40: 43). Mesoscutellum with two pairs of setæ. Legs with coxæ dark brown, trochanters yellow, femora of forelegs yellow, those of middle and hind legs yellow at both ends and broadly dark at middle, other segments yellow; empodium larger than claws; relative lengths of segments of legs 29: 28: 18: 6: 4: 3: 4 in foreleg; 34: 35: 20: 6: 5: 3: 4 in middle leg; and 37: 36: 22: 9: 6: 3.5: 4.2 in hind leg. Wings (Plate 1, fig. 2) yellow on basal area, with macrotrichia very thickly spread all over surface. Halteres with knobs white. Abdomen with tergal side all brown, sternal sclerites brown and subdivided into paired sclerites; cerci yellow.

Male.—Head and thorax almost entirely black, shiny. Antennæ with scapes and plume black; flagellum dark brown;

antennal ratio about 1.54; proportional lengths of distal four segments 44 : 76 : 58 : 74. Proportional lengths of segments of hind leg about 34 : 36 : 23 : 8.5 : 6 : 4 : 4.8. Wings with macrotrichia sparse, spread on apical part of cell R_5 and M_1. Abdomen brown, caudal segments dark brown; ultimate tergum of abdomen almost circular; hypopygium with styles (Plate 2, fig. 29) hardly as long as coxites (36 : 44), entirely pubescent but without setæ, tapering, slightly arcuated, each with a small apical spine.

Holotype.—Female; Kitasirakawa, Kyoto; November 5, 1935.

Allotype.—Male; Uzumasa, Kyoto; October 29, 1934.

Paratypes.—Males and females; Kitasirakawa and Uzumasa, Kyoto; October 29, 1934, and November 5 and 31, 1935.

This species is somewhat allied to *A. insularis* Kieffer and *A. lucorum* Meigen, but easily distinguished by the characteristic coloration of the femora.

ATRICHOPOGON (ATRICHOPOGON) WINNERTZI Goetghebuer.

Female.—Body 1.7 to 2 mm long. Mesoscutum dark brown or black, shiny. Antennal ratio 2 to 2.2. Wings with macrotrichia dense, spread almost on entire surface; bare areas along veins distinct; relative lengths of first and second radial cells 6.8 : 24.

Head dark brown on vertex, brown on frontoclypeus. Maxillary palpi slender, segmented (13 : 17 : 26 : 16 : 17), each with a sensory pore on distal part of segment three, sensillæ of pore invisible externally. Antennæ with segments one and two yellow, other segments brown; elongated distal segments paler; relative lengths of distal eight segments about 13 : 13 : 14 : 41 : 43 : 44 : 46 : 59. Thorax dark brown; scutellum somewhat paler and with four long, brown setæ besides small hairs; pleural and sternal sclerites brown; membranous areas pale brown. Legs with coxæ brown, other segments pale brown, sometimes femora of middle and hind legs broadly brown at middle and yellow on apical fourth; proportional lengths of tarsal segments of forelegs 100 : 32 : 26 : 21 : 22; those of hind leg 131 : 50 : 35 : 23 : 24. Abdomen uniformly pale brown or yellowish pale brown; spermatheca only one, almost spherical, brown.

Specimens.—Females; Kibune, Kyoto; June 1, 1930, and October 16, 1932; Uzumasa, Kyoto; October 9, 1934.

ATRICHOPOGON (ATRICHOPOGON) ROSTRATUS Winnertz.

Female.—Body about 2.4 to 2.5 mm long. Proboscis about as long as vertical length of head capsule. Head and thorax

dark brown, mat, pubescent, with brown microtrichia; scutum with shoulder areas somewhat paler. Wings (Plate 1, fig. 3) with macrotrichia rather sparse; central and basal area broadly bare; bare areas along veins distinct; relative lengths of first and second radial cells about 11 : 31. Antennal ratio about 2.24.

Antennæ with scapes yellowish brown, other segments brown; segments two to nine distinctly transverse; segment ten longer than preceding three segments taken together; relative lengths of distal five segments 43 : 43 : 46 : 46 : 60. Mesoscutellum brown. Legs with coxæ dark brown, tarsi brown, other segments pale brown; relative lengths of segments 36 : 37 : 24 : 7 : 6 : 4 : 5 in foreleg; 47 : 45 : 28 : 10 : 5.5 : 4.5 : 5 in hind leg. Halteres white. Abdomen with lateral sides broadly dark brown, tergal side pale brown.

Male.—Proboscis about as long as vertical length of head capsule. Thorax black, mat; scutellum with four black setæ. Wings without macrotrichia; relative lengths of two radial cells about 7 : 23, those of R_1 and R_{4+5} about 10 : 30. Antennal ratio about 1; relative length of distal four antennal segments about 30 : 62 : 54 : 68. Halteres white. Legs red; proportional lengths of segments of hind leg about 45 : 43 : 27 : 10.5 : 7 : 4.5 : 5. Abdomen black: hypopygium without anal points; styles (Plate 2, fig. 26) slender, almost straight, each with a small preapical point.

Specimens.—Males and females; Uzumasa, Kyoto; October 9, 1934, and Toyohara, Sakhalin; August 6, 1938.

ATRICHOPOGON (ATRICHOPOGON) FLAVENS sp. nov.

Male.—Body about 2.2 mm long. Head and thorax yellow; mesoscutum slightly shiny. Antennal ratio about 1.12. Wings with macrotrichia very scanty, spread on distal part of cells R_5 and M_1; relative lengths of two radial cells about 7 : 20.

Antennæ with scapes yellow, flagellum white or yellowish white, plumose hairs yellow; relative lengths of distal four segments 29 : 69 : 54 : 59. Scutum with two yellowish, pale-brown, lateral vittæ; scutellum pale brownish yellow. Legs with coxæ yellow, other segments white, distal ends of fore tibiæ dark; proportional lengths of segments 29 : 29 : 18 : 5.5 : 4.5 : 3 : 4 in foreleg; 37 : 36 : 23 : 8 : 6 : 4 : 4 in hind leg. Wings (Plate 1, fig. 4) with macrotrichia on veins M_1 and M_2 and distal part of cells R_5 and M_1. Halteres white. Abdomen including hypopygium white, posterior segments somewhat yellowish; styles

of hypopygium (Plate 2, fig. 28) arcuated, each with a minute preapical spine on base of apical spine.

Holotype.—Male; Arasiyama, Kyoto; May 19, 1930.

Paratopotypes.—Males; May 19 and 25, 1930.

This species is somewhat allied to *A. albiscapula* Kieffer, in which, however, segment twelve of the male antenna is shorter than segment fourteen, and the mesoscutum is brownish with three dark-brown vittæ.

ATRICHOPOGON (ATRICHOPOGON) MARGINIPILUS sp. nov.

Male.—Body about 2 mm long; coloration closely as in *A. flavens* Tokunaga. Mesoscutum with three pale-brown vittæ. Antennæ including plumose hairs white; antennal ratio about 1.1. Proboscis long, almost as long as vertical length of head capsule. Wings (Plate 1, fig. 5) with macrotrichia only along distal margin of cell R_5; cell M_1 with only about three macrotrichia at anterior distal corner; relative lengths of two radial cells about 7 : 16. Relative lengths of ultimate four antennal segments 30 : 51 : 45 : 59. Scutum with three pale-brown vittæ, mat; scutellum white; postscutellum pale brown; other sclerites yellow. Proportional lengths of segments of hind leg 33 : 32 : 18 : 7 : 5.5 : 3.5 : 3.5. Halteres white. Abdomen white; posterior segments pale brown; hypopygium white, closely as in *A. flavens.*

Female.—Proboscis almost as long as head. Antennæ with scapes yellow, flagellum pale brown; segments two to nine transverse; segment ten longer than preceding three segments put together; antennal ratio about 2.8. Thorax brown, mat; scutum with three brown vittæ separated by pale lines; scutellum yellow. Legs including coxæ yellowish white; proportional lengths of segments of hind leg 38 : 38 : 20 : 8 : 5 : 3.8 : 4. Wings much as in *A. winnertzi* Goetghebuer; proportional lengths of two radial cells 7.25. Halteres white.

Holotype.—Male; Kibune, Kyoto; June 1, 1930.

Allotype.—Female; Daisen, Tottori; July 2, 1931.

Paratypes.—Males and females; Daisen, Tottori; July 2, 1931.

This species is closely allied to *A. flavens* Tokunaga, but provided with a long proboscis and three separate thoracic vittæ.

ATRICHOPOGON (ATRICHOPOGON) PARVIFORCEPS sp. nov.

Male and female.—Body 1.5 to 1.7 mm long. Thoracic notum entirely reddish brown, slightly shiny. Legs mainly yellow,

knee joints white. Wings of male without macrotrichia; those of female with only about three macrotrichia along distal margin of cell R_5. Halteres white.

Head with eyes bare, proboscis yellowish brown, far shorter than vertical length of head. Antennæ of male mainly brown, scapes black, antennal ratio about 1; antennæ of female entirely brown, antennal ratio about 2.2; proportional lengths of distal six antennal segments of male 12:13:16:33:33:45; those of distal eight segments of female 7.5:7.5:7.8:22.5:-24:25:27:37; tenth antennal segment of female subequal in length to preceding three segments taken together; short basal flagellar segments of female transverse or spherical. Legs with coxæ brown, other segments yellow, knee joints white; empodium large; claws each with a small preapical tooth; proportional lengths of hind legs 25:22:13:4.5:3.5:2.5:2.5 in male; 23:21:11:4:2.7:2.5:2.6 in female. Wings with distinct radial intercalary fork; fMCu under middle of first radial cell; macrotrichia absent in male, very scanty and almost absent in female, only about three setæ along margin of cell R_5; relative lengths of veins R_1 and R_{4+5} about 6.5:16 in male and 7.5:20 in female; those of first and second radial cells about 5:12 in male and 6:13.5 in female; veins R_1 and R_{4+5} suddenly curved cephalad at end. Halteres white. Abdomen including hypopygium yellowish brown; styles (Plate 2, fig. 27) small, slender, about half as long as coxites, tip blunt.

Holotype.—Male; Toyohara, Sakhalin; July 31, 1938.

Allotopotype.—Female; July 31, 1938.

Paratopotypes.—Males and females; July 31, 1938.

This species is closely allied to *A. minutus* Meigen, in which, however, the female wing carries numerous macrotrichia between the intercalary forks, and the proportional lengths of two radial cells are about 1:2 in the male and 1:3 in the female.

ATRICHOPOGON (ATRICHOPOGON) EZOENSIS sp. nov.

Male.—Body about 2.2 mm long. Mesoscutum shiny, with three black vittæ separated by pale lines. Wings without macrotrichia. Halteres brown.

Antennæ including plume brown; antennal ratio about 0.86; proportional lengths of distal six segments 20:20:27:47:-39:50. Thorax black; scutellum brown. Legs dark brown. Wings without macrotrichia; fork of M_{1+2} atrophied; relative lengths of two radial cells about 7:16.5, those of R_1 and R_{4+5} about 9.5:23.5. Abdomen with tergal plates brown; hypopy-

gium with styles (Plate 4, fig. 95) slightly shorter than coxites, thickened at base, slightly arcuated.

Holotype.—Male; Beguntan, Hokkaido; July 7, 1936.

This species is closely allied to *A. minutus* Meigen, in which, however, the knobs of the halteres are white, the legs are yellow, and the second radial cell of the wing is only twice as long as the first radial cell.

ATRICHOPOGON (KEMPIA) LONGISERRA Kieffer.

Female.—Body about 2.1 mm long. Coloration similar to that of *A. brunnipes* Meigen. Antennal ratio about 1.5. Wings with macrotrichia scanty and distributed only on distal part of cells R_5, M_1, and M_2.

Mesothoracic scutellum yellow. Legs yellowish brown. Halteres white. Abdomen pale brown. Antennal segments three to seven transverse; segment ten equal in length to preceding two segments taken together; proportional lengths of distal five antennal segments about 27 : 27 : 33 : 34 : 50. Wings (Plate 1, fig. 6) with macrotrichia scanty, spread only on distal area; relative lengths of two radial cells about 11.5 : 23.

Specimens.—Female; Simogamo, Kyoto; March 7, 1930.

ATRICHOPOGON (KEMPIA) BRUNNIPES Meigen.

Male.—Body about 2 mm long. Mesothoracic scutum mat black. Legs brown or yellowish brown. Halteres white. Antennal ratio 0.9 to 0.97. Wings without macrotrichia; relative lengths of two radial cells 1 : 2.62 to 1 : 2.91.

Head, thorax, antennal scapes, and coxæ of legs entirely black; antennal flagellar segments and abdominal terga dark brown or brown; legs except coxæ brown or yellowish brown. Proportional lengths of five ultimate antennal segments 22 : 34 : 54 : 49 : 69. Hypopygium with ultimate tergum round, without markings; styles (Plate 2, fig. 40) sharply pointed, almost as long as coxites.

Female.—Coloration closely similar to that of male, but scutum somewhat paler; humeral areas of scutum and scutellum pale brown; caudoscutal area with a pair of pale-brown spots; scutal vittæ black, confluent. Legs and abdomen pale brown. Antennal ratio 1.75 to 1.68. Wings with macrotrichia rather scanty.

Proportional lengths of distal five antennal segments about 36 : 34 : 39 : 45 : 60; segments two to nine oval and short; segment ten shorter than preceding three segments put together. Legs with proportional lengths of segments 29 : 29 : 19 : 5 : 4 : 3 : 3.5 in fore-

leg; 38 : 37 : 20 : 7.5 : 5 : 4 : 4.5 in hind leg. Wings (Plate 1, fig. 7) with macrotrichia on marginal area; anal cell sometimes without macrotrichia; proportional lengths of two radial cells 1 : 3 to 1 : 3.85.

Specimens.—Males and females; Kibune, Kyoto; June 12 and November 23, 1932, and November 3, 1934; Uzumasa, Kyoto; October 29, 1934; Tsuta, Aomori-ken, October 14, 1935.

ATRICHOPOGON (KEMPIA) KAGIENSIS sp. nov.

Male.—Body about 1 mm long. Head, thorax, and abdomen yellow; legs, halteres, and hypopygium white; mouth parts yellowish white; antennæ with scapes yellowish brown, flagellar segments and plume yellowish white. Wings without macrotrichia; relative lengths of two radial cells about 20 : 60, those of R_1 and R_{4+5} about 30 : 85; all veins hyaline and difficult to distinguish against the membrane.

Antenna with terminal stylet round; antennal ratio about 0.9; proportional lengths of distal five segments 8 : 11 : 31 : 28 : 37. Hind leg with relative lengths of segments 21 : 20 : 11 : 4 : 3 : 2.5 : 3. Hypopygium with ultimate tergum round: coxites slender; styles (Plate 2, fig. 39) slightly arcuated, pubescent, sharply pointed.

Holotype.—Male; Kagi, Formosa; December 28, 1934.

Paratopotypes.—Males; December 28, 1934.

This species is characteristic in the yellow coloration and in possession of a very long second radial cell which is about thrice as long as the first radial cell, and in the round apical stylet of the antenna.

ATRICHOPOGON (KEMPIA) MARITIMUS sp. nov.

This midge was found in a small cave of a rocky seashore just above the high-tide mark.

Male.—Body about 1.5 mm long. Thorax yellow, mat. Antennæ with plumose hairs rather scanty. Wings without macrotrichia; relative lengths of two radial cells about 5 : 10.

Head, mesoscutellum, legs, and abdomen all yellowish white; halteres white; mesoscutum yellow, with white lines along foveæ. Antennæ with scapes and plumose hairs yellowish brown, flagellar segments white; antennal ratio about 1.25; proportional lengths of distal six segments 8 : 8 : 15 : 35 : 35 : 42. Legs entirely yellowish white; relative lengths of segments of hind leg 28 : 24 : 13 : 4.7 : 4 : 3 : 3.8. Hypopygium white; ultimate tergum produced caudad, oval; styles (Plate 2, fig. 34) long, fully as

long as coxites, straight, sharply pointed, pubescent only on basal part.

Female.—Coloration much as in male, but thorax sometimes brown, abdominal terga pale brown, antennæ yellowish white, and trochanters and femora white. Antennal ratio about 1.63; segment ten as long as preceding two segments put together; proportional lengths of distal five segments of antenna 20 : 24 : 26 : 27 : 40. Claws of legs (Plate 2, fig. 32) flattened and strongly angulated; proportional lengths of segments of hind legs, 28 : 24 : 13 : 5 : 3.5 : 3 : 3.8. Wings (Plate 1, fig. 8) with macrotrichia scanty, spread on distal area of cells R_5, M_1, M_2, and M_4, second radial cell about thrice as long as first radial cell.

Holotype.—Male; Azako, Mie-ken; August 8, 1934.

Allotopotype.—Female; August 8, 1934.

Paratypes.—Males and females; Toba and Azako, Mie-ken; August 6 and 8, 1934.

This species is quite distinctive in the structure of the male hypopygium and of the female claws.

ATRICHOPOGON (KEMPIA) MONTICOLUS sp. nov.

Female.—Body 2 to 2.3 mm long. Thorax black, shiny. Antennal ratio about 1.46. Wings with macrotrichia rather scanty; second radial cell very long, about four times as long as first radial cell.

Head and thorax black. Antennæ dark brown; terminal stylet very long, sharply pointed; segments two to nine oval; segment ten as long as preceding two segments taken together; proportional lengths of ultimate seven segments 18 : 20 : 38 : 40 : 40 : 41 : 63. Legs mainly yellow, coxal bases and femoral and tibial distal ends all brown; proportional lengths of segments of hind legs 41 : 42 : 23 : 9.5 : 6 : 4 : 4.5. Wings with macrotrichia rather scanty, distributed as in *A. maritimus* Tokunaga but more numerous; relative lengths of R_1 and R_{4+5} about 11.5 : 38. Halteres white. Abdomen extensively brown, caudal end white.

Holotype.—Female; Arisan, Formosa; December 27, 1934.

Paratopotypes.—Females; December 27, 1934.

This species is allied to *A. citrinipes* Kieffer and *A. hæmorrhoidalis* Kieffer. In the former the antennal ratio is about 2, and the tenth antennal segment is subequal in length to the preceding three segments put together. In the latter, the scape of the antenna is yellow, the ultimate antennal segment is about twice that of segment ten, and the wing vein R_{4+5} is twice as long as R_1.

ATRICHOPOGON (KEMPIA) YOSHIMURAI sp. nov.

Male and female.—Body about 2 mm long. Thoracic notum mainly dark brown in male and brown in female, not shiny; shoulder parts of male scutum brown; scutellum pale brown. Halteres yellowish white. Wings of male without macrotrichia, those of female with macrotrichia rather scanty, closely resembling those in *A. monticolus* Tokunaga, but anal cell with only several macrotrichia. Legs with coxæ and trochanters yellowish white; femora brown, but basal third of male legs and half of female legs brown; other segments all brown.

Antennæ dark brown; plume of male brown; antennal ratio about 1 in male and 1.56 in female; proportional lengths of ultimate four antennal segments 28: 40: 37: 51 in male and 29: 33: 33: 50 in female; segment ten of female equal in length to segment eleven or to preceding two segments put together. Proportional lengths of segments of hind legs about 34.5: 33: 19.-5: 6: 5: 3.5: 4.5. Relative lengths of two radial wing cells about 7: 14 in male and 9: 24 in female. Abdomen brown. Male hypopygium with styles (Plate 2, fig. 38) very thick, terminating in a strong spine.

Holotype.—Male; Kitasirakawa, Kyoto; July, 1934.

Allotopotype.—Female; July, 1934.

This species is somewhat related to *A. brunnipes* Meigen and *A. monticolus* Tokunaga.

ATRICHOPOGON (KEMPIA) JAPONICUS sp. nov.

Female.—Body about 1.5 mm long. Thoracic scutum black, very shiny. Eyes sparsely pubescent, very small. Antennal segments seven to nine very short, discoidal. Wings short, oval, without macrotrichia; vein R_{4+5} very thick; first radial cell slit-like.

Head and thorax dark brown. Antennæ with scapes dark brown; flagellum brown; antennal ratio about 1.95; segment ten shorter than preceding three segments put together; proportional lengths of distal five segments about 22: 25: 27: 29: 40. Legs with coxæ brown, other segments pale brown; proportional lengths of segments of legs 18: 19: 11: 3: 3: 2: 3 in foreleg; 23: 22: 11: 4: 3.5: 2.8: 3 in hind leg. Wings (Plate 1, fig. 9) without macrotrichia; relative lengths of two radial cells about 4.5: 15. Halteres yellow. Abdominal terga uniformly brown.

Holotype.—Female; Kitasirakawa, Kyoto; July, 1934.

Paratopotypes.—Females; July, 1934.

This species is somewhat allied to *A. hæsitans* Kieffer, but the thoracic scutum is not mat.

ATRICHOPOGON (KEMPIA) SPINIVENTRIS sp. nov.

Male.—Body about 1.6 mm long. Wings without macrotrichia. Antennal ratio about 1.

Head brown, eyes sparsely pubescent. Thorax brown, not shiny; scutum with pale line along foveæ; scutellum pale brown. Antennæ with scapes brown, flagellar segments pale brown, plumose hairs yellow; proportional lengths of distal four antennal segments about 22:44:41:51. Legs with coxæ brown, other segments white; relative lengths of segments of hind leg 30:-29:15:5:4:3:4. Wings without macrotrichia; M_{1+2} about as long as r-m; relative lengths of two radial cells about 7.5:14. Halteres white. Abdomen white; coxites short, thick; styles (Plate 2, fig. 36) large, as long as coxites, simple.

Female.—Head, thorax, and abdomen dark brown; scutum mat; scutellum brown; antennæ with scapes dark brown, flagellar segments brown; legs brown; proportional lengths of segments of hind leg 31:29:16:6:4:3:3. Antennal ratio about 1.4; relative lengths of five distal segments of antenna about 25:-24:22:24:35. Wings with macrotrichia thick, spread all over surface; bare lines along veins distinct; relative lengths of two radial cells about 8:18. Halteres white. Abdomen dark brown, with two pairs of strong spinelike appendages (Plate 2, fig. 30).

Holotype.—Female; Kibune, Kyoto; August 17, 1932.

Allotopotype.—Male; August 17, 1932.

Paratypes.—Males and females; Hatizyo and Kubune, Kyoto; May 25, 1930, and August 17, 1932.

This species is characteristic in the distribution of macrotrichia of the female wing and in the structure of the ventral abdominal processes of the female.

ATRICHOPOGON (KEMPIA) DORSALIS sp. nov.

Female.—Body 1.4 to 1.7 mm long. Head and thorax brown or dark brown; scutum shiny, dark brown, with shoulder parts and areas of foveæ pale brown. Wings closely similar to those of *A. brunnipes* Meigen in the distribution of macrotrichia and in the venation.

Antennæ with scapes dark brown, flagellar segments pale brown; antennal ratio 1.93 to 2.1; segments three to nine discoidal; proportional lengths of ultimate five segments 30:33:-33:37:48. Legs pale brown; proportional lengths of segments of hind leg 35:34:17:6:4.5:3.4. Wings similar to *A. brun-*

nipes Meigen; relative lengths of two radial cells 1.3 to 3.6; in some specimens first radial cell very narrow and slitlike, and vein M_1 bent under intercalary radial fork. Halteres yellowish brown. Abdomen extensively yellowish brown; dorsal side with a pair of brown lateral stripes.

Holotype.—Female; Uzumasa, Kyoto; October 29, 1934.

Paratypes.—Females; Kibune and Uzumasa, Kyoto; May 30, 1930, and October 29, 1934.

This species is related to *A. brunnipes* Meigen, but the antennal ratio is larger, segments eleven and twelve are equal in length, and the abdominal dorsal side is not uniformly pale brown.

ATRICHOPOGON (KEMPIA) AKISUKII sp. nov.

Male.—Body about 2 mm long. Head and thorax dark brown; scutum slightly shiny, brown along foveæ, with humeral areas pale brown; caudoscutal area with a pair of yellowish-white spots. Wings yellowish brown, without macrotrichia; proportional lengths of two radial cells about 7:11; those of R_1 and R_{4+5} about 9:17.

Eyes uniformly pubescent, contiguous above. Antennæ with scapes dark brown, flagellar segments and plumose hairs brown; antennal ratio about 0.88; total length of ultimate four segments equal to total length of basal segments two to nine; proportional lengths of ultimate seven segments 16:17:16:26:34:30:40. Mesothoracic scutellum brown. Legs with coxæ dark brown, other segments brown; empodium longer than claws; proportional lengths of segments of hind leg 31:28:12:4.5:4:2.5:4. Wing venation: fMCu under distal end of first radial cell, vein M_1 atrophied at base. Knob of haltere yellowish white. Abdomen extensively brown; terga dark brown; styles (Plate 3, fig. 51) of hypopygium as long as coxites, thickened on basal two-thirds, slightly curved on apical third, with chitinized ridge on distal part.

Holotype.—Male; Sikuka, Sakhalin; July 18, 1938.

Paratopotype.—Male; July 18, 1938.

This species is allied to *A. hæsitans* Kieffer, *A. infuscus* Goetghebuer, and *A. fuscus* Winnertz. But in the first allied species the pubescence of the eyes is sparse and short; in the second, the total length of the ultimate four segments of the antenna is shorter than the total length of segments two to nine; (47:53); in the third, the proportional lengths of the ultimate four antennal segments are 13:20:15:17, the total length of

the ultimate four segments of the antenna is greater than that of segments two to nine, and the relative lengths of the two radial cells is 1:2 to 3.

ATRICHOPOGON (KEMPIA) CLAVIFUSCUS sp. nov.

Male.—Body about 2 mm long. Head and thorax black; mesothoracic scutum shiny; abdomen dark brown. Antennal ratio about 0.86. Wings without macrotrichia; second radial cell twice as long as first radial cell.

Antennæ pale yellowish brown, plume yellow; proportional lengths of ultimate five segments 20:33:50:43:50. Legs extensively pale yellowish brown; tibiæ, tarsi, and both ends of femora yellowish white; proportional lengths of segments of hind leg 40:41:24:8:6.5:4:4.5. Halteres white. Styles (Plate 2, fig. 37) of hypopygium sharply pointed, thick at base, slightly arcuated.

Female.—Body about 1.5 mm, almost entirely dark brown; scutum mat, pubescent with yellow hairs; shoulder parts brown. Halteres dark brown. Wings with macrotrichia as in *A. brunnipes* Meigen; first radial cell about half of second radial cell in length. Antennal ratio about 1.4.

Antennal segments two to nine discoidal; following five segments oval, about 20:23:23:23:34.5 in relative length; tenth segment slightly shorter than preceding two segments put together. Legs dark brown; proportional lengths of segments 23:23:14:4:4:3:3 in foreleg; 30:27:15:5:4:3.5:3:5 in hind leg. Abdomen brown, with tergal plates dark brown.

Holotype.—Male; Arasiyama, Kyoto; October 2, 1930.

Allotype.—Female; Uzumasa, Kyoto; October 11, 1934.

This species is related to *A. fuscus* Winnertz and *A. infuscus* Goetghebuer, in the former of which, however, the female has the antennal ratio 2.45, the thoracic scutum shiny, the scutellum yellowish, the legs yellow, the first radial cell only one-third as long as the second cell, and the macrotrichia absent in M_4 and anal cell. In the latter the female has the antennal ratio 1.86 and the halteres white, and the male has the legs dark brown.

ATRICHOPOGON (KEMPIA) KYOTOENSIS sp. nov.

Male.—Body about 2.2 mm long, almost entirely black; thoracic scutum slightly shiny. Wings without macrotrichia; relative lengths of two radial cells about 6:20. Antennal ratio about 1.1.

Antennæ with scapes black, flagellar segments dark brown; relative lengths of distal seven segments about 24 : 23 : 22 : 34 : 51 : 48 : 66. Legs with coxæ black, other segments dark brown; proportional lengths of segments 29 : 29 : 20 : 6 : 4 : 3.7 : 4 in foreleg; 39 : 38 : 23 : 9 : 5.5 : 3.5 : 4.5 in hind leg. Halteres white. Abdominal terga brown; styles (Plate 3, fig. 46) of hypopygium as long as coxites, slender, sharply pointed, slightly arcuated. Wing with M_{1+2} very short, only about one-third of r-m.

Holotype.—Male; Kitasirakawa, Kyoto; November 5, 1935.

Paratopotypes.—Males; November 5, 1935.

This species is closely allied to *A. brunnipes* Meigen, in which, however, the second radial cell is longer than two and a half times the first cell, the bare apical area of the style of the hypopygium is shorter, and vein M_{1+2} is longer than in the present species.

ATRICHOPOGON (KEMPIA) PILOSIPENNIS sp. nov.

Male and female.—Body 1.5 to 1.9 mm long in male and 1.8 to 2 mm in female. Thoracic scutum dark brown, with three vittæ black and shiny. Halteres yellowish white in female and brown in male. Wings brown, with macrotrichia; in female (Plate 1, fig. 10) macrotrichia spread all over surface and in male (Plate 1, fig. 11) macrotrichia very scanty and distributed only on distal part of cells R_5, M_1, and M_2. Antennal ratio about 1.67 in female and 0.77 in male.

Antennæ with scapes dark brown, flagellar segments brown; proportional lengths of distal six segments 12.5 : 27 : 29 : 31 : 31 : 43 in female; 18 : 18 : 22 : 37 : 37 : 51 in male. Mesothoracic scutellum brown, with four long setæ. Legs brown. Female wing with thick macrotrichia, bare areas along veins distinct; male wing with very scanty macrotrichia; relative lengths of two radial cells about 12 : 25 in female, 8 : 18 in male. Abdomen extensively yellow, with sternal and tergal plates pale brown. Male hypopygium brown, with coxites slender, very long; styles (Plate 2, fig. 33) slender, about half as long as coxites, with three apical spines. Abdominal ventral processes of female (Plate 2, fig. 31) highly chitinized; ninth sternum with one pair of serrulated projections; eighth sternum with three pairs of characteristic projections; spermatheca only one, dark brown, spherical.

Holotype.—Male; Kibune, Kyoto; October 16, 1934.

Allotopotype.—Female; October 16, 1934.

Paratopotypes.—Males and females; October 16 and November 3, 1934.

This species is somewhat allied to *A. pavidus* Kieffer, in which, however, the macrotrichia of the female wing are more scanty, the basal third of cells M_1 and M_2 are bare, the female antennal ratio is 1.3, segment twelve of the male antenna is longer than segment thirteen, and the tarsal segments of the male legs are paler than the other segments.

ATRICHOPOGON (KEMPIA) FLAVISCUTELLUM sp. nov.

Male.—Body 2.4 to 2.5 mm long. Mesothoracic scutum black, mat, sometimes with paler lines along foveæ; scutellum yellowish white. Second radial wing cell shorter than twice first cell. Antennal ratio 0.9 to 1.

Antennæ with scapes black, flagellar segments and plume dark brown or brown; proportional lengths of distal six segments about 18.5 : 18.5 : 31 : 44.5 : 38.5 : 55.5. Legs brown. Wings without macrotrichia; relative lengths of two radial cells 8.5 to 9.5 : 13 to 16. Halteres pale brown. Hypopygium similar to that of *A. clavifuscus* Tokunaga.

Holotype.—Male; Kitasirakawa, Kyoto; October 15, 1937.

Paratypes.—Males; Wati, Kyoto; May 17, 1936.

This species is closely related to *A. clavifuscus* Tokunaga, but the scutellum is much paler, the scutum is not shiny, and the second radial wing cell is shorter than twice the first.

JOHANNSENOMYIA SHIBUYAI sp. nov.

Male.—Body about 3 mm long, almost entirely black, with yellow markings. Femora yellow, black on distal end of fore femur and on distal third of midle and hind femora; tibiæ black, broadly brown at middle. Abdomen largely black, extensively yellow on second tergum.

Head black. Antennæ with scapes black, flagellar segments brown; antennal ratio about 0.73; proportional lengths of distal six segments 4 : 4.1 : 6.5 : 8.5 : 11.8 : 14.5. Legs without femoral spines; fore coxa dark brown, mesal side yellow, other coxæ entirely dark brown; trochanters yellow; fore femur yellow, distal end narrowly black; other femora yellow on basal two-thirds and black on distal third; fore tibia black, middle part broadly brown, other tibiæ entirely black; tarsal segments one to four pale brown or white, distal ends of these segments and ultimate tarsal segments black; claws simple, equal; pulvilli absent; proportional lengths of segments of hind leg about 68 : 60 : 30 : 17 : 8 : 5 : 10. Wings (Plate 2, fig. 23) yellow on

basal area, broadly gray on distal area beyond crossvein and on anal margin; veins brown, without macrotrichia. Halteres dark brown. Abdomen extensively black; first tergum with a white spot on anterior margin; second tergum extensively yellow, with a narrow dark band on posterior margin; first and second sterna yellow. Hypopygium (Plate 3, fig. 43) with coxites elongated; styles small, curved.

Female.—Body 4 mm long; coloration similar to that of male. Middle and hind femora black at distal end, each with a narrow dark preapical ring; ultimate tarsal segment with sixteen strong ventral bristles. Antennal ratio about 1.34.

Head yellow in frontal aspect. Maxillary palpi yellow on proximal segments and dark brown on distal two segments. Antennæ with scapes dark brown; second segments yellow basally and black distally; following five segments with gradually increasing dark area distally; other seven segments entirely black, about 4.7 : 4.7 : 9.8 : 10 : 10 : 11.5 : 14 in proportional length. Thorax without scutal spine, bristles, and humeral pits. Legs without femoral spines. Fore coxa yellow, partially yellow at tip; fore femur as in male, middle and hind femora yellow, black at end and each with a narrow preapical dark ring; fore and middle tibiæ black, brown at middle; hind tibia entirely black; proximal two tarsal segments yellowish white, black at tip; following two segments brown; last segments black; in hind leg fourth tarsal segment as in preceding segments in coloration; proportional lengths of segments 55 : 53 : 20 : 10 : 5 : 4 : 13.5 in foreleg; 90 : 83 : 44 : 21 : 9 : 5 : 13.5 in hind leg. Proportional lengths of two radial wing cells about 20 : 55. Abdominal coloration similar to that of male; terga three to eight dark brown, very narrowly white at caudal margin; tergum nine dark brown; sterna of segments one and two white, those of following five segments yellowish brown; spermathecæ two, very unequal, both oval and black.

Holotype.—Male; Ikeda, Osaka; May 17, 1935.

Allotopotype.—Female; May 21, 1935.

Paratopotypes.—Males and females; May 17 and 21, 1935.

This species is related to *J. setigera* Loew and *J. nitida* Macquart, in the former of which the ultimate antennal segment of the male is thrice as long as segment twelve, the tibiæ of all legs and the hind tarsi are uniformly black; the antennal ratio in the female is less than 1, and the second tarsal segments of all legs are entirely black. In the latter the middle and hind femora of the female are broadly black distally and the total

length of the proximal two tarsal segments of the hind leg is subequal in length to the tibia.

STILOBEZZIA MONTICOLA sp. nov.

Male.—Body about 2.2 mm long, yellowish white. Wings unmarked, with macrotrichia only on distal area. Legs entirely yellowish white. Abdomen uniformly white or yellowish white.

Eyes very narrowly separated above. Antennæ with scapes yellow; flagellar segments white, with brown plume; antennal ratio about 0.84; proportional lengths of distal eight segments 19:20:21:23:26:56:76:65. Thoracic scutum with yellow vittæ, beset with dark setæ; scutellum with eight black setæ; other parts all yellowish white. Legs uniformly yellowish white or white; middle and hind tibiæ with rather long setæ on dorsal side; proximal three tarsal segments of foreleg each with an apical spine; those of middle legs each with two apical spines; those of hind legs without apical spines; first tarsal segment of middle leg with a basal spine; claws simple, each with a long basal seta; proportional lengths of segments of legs 38:36:22:12:4:3:5 in foreleg; 49:47:28:12.5:5:3:5 in middle leg; and 45:46:25:13:5:3:6 in hind leg. Wing without colored markings; macrotrichia present on distal areas of cells R_5 and M_1, sometimes absent in cell M_1. Venation: second radial cell long, about two and a half times the length of first cell, M_{1+2} long, longer than r-m, fMCu under r-m, M_{3+4} ending just before or at level of tip of R_{4+5}. Halteres yellowish white. Abdomen entirely yellowish white or white; terga highly setigerous with yellow slender hairs; hypopygium (Plate 4, fig. 93) closely resembling that of *S. lutacea* Edwards, but styles stouter and entirely pubescent, parameres simple and not bifid at tip, and chitinized parts all yellow.

Female.—Antennæ yellowish white; antennal ratio about 1.1; proportional lengths of distal eight segments about 26:30:39:48:51:52:50:62. Legs each with only one simple claw; fourth tarsal segment cylindrical; proportional lengths of segments of hind leg about 50:50:27:13:4.5:4:7.5. Wings (Plate 4, fig. 91) with macrotrichia somewhat thicker than in male, on distal area of cells R_1, M_1, and M_2. Other characters as in male.

Holotype.—Male; Mount Daisen, Tottori-ken; July 2, 1931.

Allotype.—Female; Kibune, Kyoto; May 30, 1930.

Paratype.—Male; Mount Daisen, Tottori-ken; July 2, 1931.

This species is allied to *S. seror* Johannsen and *S. lutacea* Edwards. In the former the male wing is quite bare, and in the latter the hypopygium is different.

STILOBEZZIA ALBICORNIS Kieffer.

Female.—Body about 1.7 mm long; wings about 1.6 mm long. Thorax entirely black, shiny. Hind leg with a pale ring before and beyond knee joint; fifth tarsal segments of all legs each with two strong bristles on ventral side. Wings unmarked, held divergent at an angle of about 45° at rest.

Head yellow, eyes slightly separated above; proboscis pale brown; maxillary palpi dark brown. Antennæ with scapes yellow, segments two to nine white, following five segments pale brown. Legs mainly yellowish white; knee joints and distal tips of tibiæ of middle and hind legs dark; hind femur broadly dark at middle, with a white preapical ring; hind tibiæ also broadly dark at middle, with a white ring before and beyond ends; fourth tarsal segments cordiform; fifth tarsal segments (Plate 2, fig. 35) cylindrical, each with a pair of strong black basal bristles and a pair of slender apical setæ on ventral side; claws very unequal, simple, longer claw twice as long as shorter. Wings (Plate 4, fig. 89) unmarked, without macrotrichia; second radial cell about four times as long as first; fMCu beyond r-m. Haltere with stem yellowish white; knob yellowish white on ventral side and apical half of dorsal side, brown on basal half of dorsal side. Abdominal terga black and shiny, tergum one greenish white with a pair of black spots.

Specimen.—Female; Hatizyo, Kyoto; June 30, 1938.

STILOBEZZIA NOTATA de Meijere.

Stilobezzia decora Kieffer, Ann. Mus. Nat. Hung. 14 (1916) 89, 90; Ann. Soc. Linn. Lyon 68 (1922) 159.

Male.—Body 1.5 to 2.8 mm long, yellowish white. Wings with small dark clouds. Abdominal terga with dark markings.

Antennæ bicolorous, yellowish white on basal and distal third and brown on middle third; antennal ratio about 0.9; proportional lengths of distal eight segments 25 : 25 : 27 : 28 : 35 : 78 : 90 : 141. Thorax shiny, with dark-brown setæ; scutum brown along lateral and anterior margins; postscutellum white on anterior half and dark brown on posterior half; sternepisternum and epimeron brown. Legs white, knee joints of middle and hind legs dark brown; tibial ends of these legs also dark brown; first tarsal segment of middle leg with a basal and two apical spurlike bristles; second tarsal segments of same leg with two

apical bristles; other legs without tarsal spurs; third tarsal segment somewhat flat; fourth segment cordiform; claws bifid at tip; in some specimens distal half of first tarsal segments, following four segments of fore- and middle legs, and all tarsal segments of hind legs pale brown. Wings with two small clouds at base, a cloud covering r-m, two clouds in cell R_5, faint clouds covering M_1, M_2, M_{3+4}, Cu_1, Cu_2, 1A, and a furrow in cell M_2. Venation: second radial cell about thrice as long as first, fork of M_{1+2} under middle of second radial cell, fMCu under base of second radial cell. Halteres with stems white, knobs brown. Abdominal terga one to three white, those of other segments yellow in ground color; in some specimens posterior segments including hypopygium yellowish brown; terga four to six each with two pairs of brown spots, terga three to seven each with a pair of brown spots. Hypopygium (Plate 4, fig. 92) with coxites swollen mesad at base; styles entirely pubescent, pointed at tip.

Female.—Body about 2.2 mm long. Coloration somewhat different from that in male.

Head brownish yellow on vertex, yellow on frontal side. Eyes separated by a narrow line. Mouth parts brown. Antennæ yellow; antennal ration about 1.5; proportional lengths of distal eight segments 22 : 22 : 24 : 49 : 56 : 56 : 58 : 82. Thorax yellow; scutum with yellow median vittæ which are surrounded by brown rings, and lateral vittæ which are dark brown at posterior end; caudoscutal area and scutal lateral margins somewhat brown; postscutellum with a pair of yellowish-brown clouds; pleural side with a broad, oblique, brown band which arises from base of wing and ends at ventral ridge of fore-coxal articulation. Legs extensively yellow; in middle and hind legs femora dark brown on distal two-fifths and each with a distinct yellow preapical ring, tibiæ dark brown at end and each with a dark-brown ring beyond base; third and fourth tarsal segments of all legs brown and flattened; fifth tarsal segments of fore and middle legs each with a pair of strong ventral bristles on basal part and a single claw that is provided with a large basal tooth. Wings (Plate 4, fig. 90) with second radial cell very large, about four times as long as first; fork of M_{1+2} far before middle of second radial cell. Abdomen yellow, with dark-brown tergal markings: terga of segments two and three each with three dark spots, those of segments five, six, and seven each with two smaller dark spots, terga four dark brown, with two pairs of yellow spots; cerci round.

Specimens.—Males and females; Hatizyo, Kyoto; March 23 and May 25, 1930; Seto, Wakayama-ken; August 23, 1930; Kagi, Formosa; December 28, 1934.

DICROBEZZIA SUGIYAMAI sp. nov.

Female.—Body about 3.5 mm long, black, shiny. Costa of wing slightly produced beyond end of R_{4+5}. Legs with femora and tibiæ black. Abdomen white, with black spots.

Head black on vertex, yellowish brown on frontal aspect; maxillary palpi pale yellow. Antennæ with scapes yellowish brown, short flagellar segments white, long distal segments dark; antennal ratio about 1.43; proportional lengths of distal nine segments 25:25:27:34:64:66:65:64:77. Thorax entirely black, shiny, with many strong setæ. Coxæ of fore- and middle legs black, those of hind legs reddish yellow on basal half and white on distal half; trochanters yellowish brown; femora mainly black, yellowish brown on basal part; tibiæ black, each with a small yellowish-brown ring beyond basal end; tarsi extensively white, brown on ultimate segments; ultimate tarsal segment with many (11 to 15) ventral bristles; apical tarsal spurlike bristles present only on first tarsal segment of middle leg; claws each with a basal tooth, basal tooth of one claw larger than that of other claws. Proportional lengths of segments of legs 60:58:24:9:4:3:14 in foreleg; 73:57:28:9:4:3.5:11 in middle leg; and 82:68:35:13:6:4:11 in hind leg. Wings (Plate 4, fig. 88) with main veins pale brown, costa slightly produced beyond end of R_{4+5}, R_1 slightly sinuous, R_{4+5} about thrice as long as R_1. Halteres white. Abdomen white; terga three to five with transverse black spots.

Holotype.—Female; Uzumasa, Kyoto; July 9, 1936.

This species is allied to *D. venusta* Meigen, but the coloration of the legs is notably different.

CHIRONOMIDÆ

TANYPODINÆ

PROCLADIUS (PROCLADIUS) KARAHUTOENSIS sp. nov.

Male and female.—Body 3.5 to 4 mm long. Coloration much as in *P. nipponicus* Tokunaga. Male antennal ratio about 2.2. Styles of male hypopygium small, without basal lobes. Legs without beards.

Male antennal ratio about 2.2; female antennæ fourteen-segmented. Thorax almost entirely black; pronotum yellow, with dark clouds; scutum with shiny black vittæ, humeral areas of

female yellow; areas along foveæ dusted with gray, caudoscutal area with a pair of small pruinose spots. Wings yellow on basal area, dark on distal half and anal area, each with a central dark spot covering r-m; macrotrichia thickly spread all over surface; veins dark brown; mediocubital ratio 0.75 to 0.8. Halteres yellow. Styles of male hypopygium (Plate 3, fig. 44) small, without trace of basal lobes.

Holotype.—Male; Sikuka, Sakhalin; July 15, 1938.

Allotopotype.—Female; July 15, 1938.

Paratopotypes.—Male and females; July 15, 1938.

This species is very closely allied to *P. nipponicus* Tokunaga, which differs from it in the following points: the style of the male hypopygium is provided with a blunt basal lobe, and the male antennal ratio is at most 1.9.

PENTANEURA CIRCUMDATA sp. nov.

Female.—Body 1.5 to 2.7 mm long. Thoracic mesonotum white, with three yellow scutal vittæ, lateral vittæ dark around margin. Femora white, each with a dark apical ring. Wing with two large dark bands. Abdomen with dark-brown tergal bands on anterior margins of segment.

Antennæ 12-segmented; proportional lengths of distal five segments about 18:18:18:20:50; antennal ratio about 2.58. Thoracic scutum white, with three yellow vittæ, median vitta subdivided and with dark clouds on anterior and posterior ends, each lateral vitta provided with a dark marginal ring; scutellum white; postnotum dark brown; pleural sclerites yellowish brown; sternal side white. Legs including coxæ white; femora each with a dark apical ring. Halteres white. Wings (Plate 2, fig. 24) with two dark, broad bands, proximal band incomplete at vein 1A and covering r-m; distal band complete, arising from distal ends of R_1 and R_{2+3} and ends on Cu_1, distal end of wing dark; fork of R_{2+3} complete, costa not produced beyond tip of R_{4+5}. Abdominal segments two to six each with a dark-brown band on anterior margin of tergum and white on posterior part; segment one entirely white; tergum seven entirely dark brown.

Holotype.—Female; Sizyukei, Formosa; December 29, 1934.

Paratopotypes.—Females; December 29, 1934.

This species is allied to *P. maculipennis* Zetterstedt, but the vertex of the head is not dark, the lateral scutal vittæ are not provided with black spots at the caudal end, the distance between the tips of M_{1+2} and R_{4+5} is greater than that between the

tips of M_{1+2} and M_{3+4}; these two distances are subequal in the allied species, and the basal band of the wing is far broader.

PENTANEURA PLEURALIS sp. nov.

Male and female.—Body 1.3 to 1.5 mm long. Male antennæ 15-segmented; antennal ratio about 1. Female antennæ 12-segmented; antennal ratio about 0.25; proportional lengths of distal five segments about 13 : 13 : 14 : 14 : 35. Thorax extensively yellowish white; scutum with three yellow vittæ on yellowish-white ground color, median vitta subdivided, with dark small clouds, lateral vittæ each with a dark stripe on lateral margin; postnotum dark brown; either pleural side with a distinct, oval, dark-brown spot on central part. Legs white, femoral tip somewhat dark. Wing (Plate 2, fig. 25) with a dark band just beyond r-m; costa not produced beyond tip of R_{4+5}; fork of R_{2+3} complete. Abdominal segments three, four, six, and seven entirely dark brown; segment one with a pair of brown clouds on lateral sides; tergum two yellow, with a narrow brown band on anterior margin; terga five, eight, and nine entirely yellow. Male hypopygium with styles (Plate 3, fig. 52) very slender, slightly arcuated, pubescent and setigerous on basal two-thirds, bare on distal third.

Holotype.—Male; Sizyukei, Formosa; December 29, 1934.

Allotopotype.—Female; December 29, 1934.

Paratopotypes.—Females; December 29, 1934.

This species is quite distinctive in the possession of a dark-brown central pleural spot and a dark band on the wing.

ORTHOCLADINÆ

METRIOCNEMUS (METRIOCNEMUS) PICIPES Meigen.

Male.—Body about 3 mm long, entirely black. Antennal ratio 2.5 to 3. Thorax black, with black setæ. Wings with squama black, main veins black, macrotrichia spread all over surface but rather scanty on basal half, bare area along R_{4+5}; costa produced beyond tip of R_{4+5} as long as r-m; R_{2+3} extending parallel to R_1; wing membrane white. Halteres black. Male hypopygium with anal point small; coxites without lobes, styles slender, without distinct ridge.

Specimens.—Males; Sikuka, Sakhalin; July 21, 1938.

CRICOTOPUS NITENS (Kieffer).

Trichocladius nitens KIEFFER, Philip. Journ. Sci. 18 (1921) 576, 577.

Male.—Body about 2.5 mm long. Thorax yellow, with three dark scutal vittæ. Abdominal terga of segments one and seven

entirely yellow; tergum two with a pair of dark spots on anterior margin; tergum four with a narrow dark band on anterior margin; terga five and six dark on anterior two-thirds, yellow on posterior third; terga three, eight, and nine entirely dark.

Thorax almost entirely yellow; scutum with three black vittæ, caudoscutal area with a brown cloud; postnotum black; pleural side with brown clouds. Coxæ, trochanters, and femora yellow; femoral end broadly dark; tibiæ white, with distal end broadly black; tarsi brown; no pulvilli. Wings with veins brown. Venation: costa a little produced beyond tip of R_{4+5}, R_{2+3} ending at middle between tips of R_1 and R_{4+5}, fMCu just beyond r-m, relative lengths of R_1 and R_{4+5} about 17: 37. Halteres white. Coxite of hypopygium with a small, bare, mesal lobe; styles swollen on apical part, without chitinized ridge (Plate 3, fig. 55).

Specimen.—Male; Taihoku, Formosa; August 28, 1937.

According to Kieffer, in the male the antennal ratio is slightly greater than 1 and the terga of abdominal segments five, six, and seven are entirely dark brown, while in the female segment seven is entirely yellow. This species was originally described by Kieffer as *Trichocladius nitens* from Taihoku and Daitotei, Formosa.

CRICOTOPUS TRIFASCIA Edwards.

Male and female.—Body 2.5 to 3 mm long, yellow in ground color. Thorax with four black vittæ on yellow scutum; scutellum and postscutellum black; abdomen yellow on segments one, four, and nine, black on other segments. Antennal ratio of male about 1.45. Legs mainly black; fore and middle tibiæ broadly pure white at middle; fore tarsal segments entirely black; no beards and pulvilli. Wings slightly milky white; costa produced beyond end of R_{4+5}, fMCu just beyond r-m, 1A extending far beyond fMCu. Second dark abdominal tergum of female with a yellow band on anterior part. Male hypopygium white; coxites without lobes; styles (Plate 3, fig. 56) each with a dorsal ridge.

Specimens.—Males and females; Titori, Sakhalin; August 3, 1938.

CRICOTOPUS TAIWANUS sp. nov.

Female.—Body about 1.8 mm long. Thoracic sclerites uniformly dark brown; scutum with three vittæ dark and subconfluent; pleural and sternal sclerites somewhat paler. Legs with pulvilli, color as in *C. nitens* (Kieffer); proportional lengths of segments of hind leg about 36: 43: 23: 12: 10: 5: 5. Antennæ

6-segmented (17: 24: 14: 15: 14: 38). Wings with veins yellowish brown; R_1 and R_{4+5} swollen; venation as in *C. nitens* but fMCu under r-m. Halteres white. Abdominal terga one and four yellow; terga three, eight, and nine black; terga two, five, and six dark and narrowly yellow on anterior margin; tergum seven yellow and narrowly dark on posterior margin.

Holotype.—Female; Sizyukei, Formosa; December 29, 1934.

This species is quite distinctive in the coloration of the thoracic and abdominal terga.

CRICOTOPUS TREMULUS Linnæus.

Male.—Body about 3 mm long, black in ground color. Thorax extensively black, only pronotum and humeral areas white. Legs with tibiæ and second and third tarsal segments white. Abdomen white on first two segments, black on other segments.

Antennal ratio about 1.5. Legs without beards and pulvilli, tibiæ of all legs black on basal end and apical third, white on basal two-thirds; second tarsal segments of all legs white; third tarsal segments of forelegs entirely white, those of middle and hind legs mainly white, black only on distal end; first, fourth, and fifth tarsal segments entirely black. Wings brown, costa slightly produced beyond tip of R_{4+5}. Dark abdominal segments somewhat paler on anterior margin. Hypopygium with tergum nine black, coxites each with a small, pubescent, setigerous, mesal lobe; styles flattened, each with a prominent preapical projection, ridges obscure (Plate 3, fig. 53).

Specimens.—Males; Toyohara, Sakhalin; July 31, 1938.

CRICOTOPUS BITUBERCULATUS sp. nov.

Male.—Body length about 3 mm. Thoracic coloration closely as in *C. trifascia* Edwards. First and second abdominal segments entirely yellow; following six segments mainly black, tergum three with a posterior, narrow, yellow band; tergum four with very narrow anterior and posterior yellow bands, tergum five with an anterior, narrow, yellow band. Coloration of legs also as in *C. trifascia;* no pulvilli.

Antennal ratio about 1.42. Wings with veins brown, R_{2+3} ending at middle between ends of R_1 and R_{4+5}, costa produced beyond end of R_{4+5}, fMCu slightly beyond r-m, 1A extending beyond fMCu. Hypopygium with tergum nine white; coxites each with two small setigerous tubercles on mesal side; styles suddenly thickened on distal two-thirds, with dorsal ridge (Plate 3, fig. 54).

Holotype.—Male; Titori, Sakhalin; August 31, 1938.

This species is somewhat related to *C. festivus* Meigen and *C. annulator* Goetghebuer, in the former of which, however, the dark mesoscutal vittæ are confluent and the second abdominal tergum is provided with a dark anterior band, and in the latter the mesoscutum is black except for yellow humeral areas, and the second abdominal tergum is provided with a narrow, faint, black band.

SPANIOTOMA (ORTHOCLADIUS) MULTIANNULATA sp. nov.

Male and female.—Body about 3.8 mm long. Thorax entirely black, shiny. Male antennal ratio about 2.44. Female antennæ moniliform, long, 11-segmented. Female cerci rhombic, pointed caudad.

Eyes bare, reniform. Antennæ dark brown, 11-segmented in female (15 : 30 : 23 : 23 : 23 : 23 : 22 : 22 : 21 : 23 : 45). Thorax black, shiny. Legs entirely dark brown, filiform; basal two tarsal segments with apical spurs; empodium very small; pulvilli absent; female claws simple, male claws slightly spatulate and serrulate at tip; proportional lengths of tarsal segments of hind leg about 67 : 33 : 24 : 14 : 9 in male and 65 : 32 : 24 : 12 : 8 in female. Wings with numerous microtrichia, yellowish pale brown on anterior cells C, Sc, R_1, and R_3. Venation: costa a little produced beyond tip of R_{4+5}, Cu_1 arcuated on distal half, 1A straight and far beyond fMCu, relative lengths of R_1 and R_{4+5} about 55 : 105 to 55 : 110; anal lobe of male prominent, that of female round. Halteres white. Abdomen of male dark brown, each tergum with a narrow dark caudal band; that of female with sternal and tergal sides brown; male hypopygium without anal point, coxites each with a large swollen basal lobe on mesal side, styles (Plate 3, fig. 57) flat, each with a small apical ridge and a long black apical spine; cerci (Plate 3, fig. 63) white, rhombic, pointed caudad.

Holotype.—Male; Arisan, Formosa; December 27, 1934.

Allotopotype.—Female; December 27, 1934.

This species is highly characteristic in the structure of the female antennæ and in the shape of the female cerci.

SPANIOTOMA (LIMNOPHYES) FUSCIPYGMA sp. nov.

Male.—Body about 1.5 mm long. Thorax entirely brown, shiny, without scales; scutum with vittæ darker and confluent. Antennæ with very short ultimate segments. Legs without pulvilli; second and third tarsal segments of hind legs subequal in length. Ultimate tergum with a blunt, small, pubescent, anal point; styles slender, with dorsal ridge and apical spine.

Head with eyes bare and reniform. Antennæ 14-segmented but last segmentation incomplete; ultimate segment with long pubescence, shorter than preceding three segments taken together; plume rather scanty; antennal ratio only 0.14. Proportional lengths of segments of hind legs 28:31:16:5:8.5:8:3.5:4. Wings with distinct microtrichia; squama with only three setæ. Venation: costa produced beyond tip of R_{4+5}, R_{2+3} ending at middle between tips of R_1 and R_{4+5}, fMCu far beyond r-m, Cu_1 curved downwards, 1A ending before fMCu. Halteres brown. Abdomen uniformly brown; hypopygium with anal point small, blunt, pubescent; coxites each with a minute, blunt, mesal lobe; styles slender, each with a dorsal ridge and a long apical spine (Plate 3, fig. 59). Legs, antennæ, and mouth parts brown.

Holotype.—Male; Sizyukei, Formosa; December 29, 1934.

This species is somewhat allied to *S. minimus* Kieffer, in which, however, each coxite of the male hypopygium is provided with a large mesal lobe, and the antennal ratio is 0.6.

SPANIOTOMA (SMITTIA) TIPULIFORMIS sp. nov.

This species was collected along a stream at Mount Ari, Formosa.

Male.—Body about 3 mm long, brown in ground color. Legs, wings, and abdomen much elongated. Thorax with three shiny, brown vittæ on yellowish-brown scutum. Abdomen brown; abdominal terga each with a narrow dark band on caudal margin. Antennal ratio about 1, ultimate segment with forked long sensillæ at tip.

Head with eyes reniform, bare. Antennæ 14-segmented, with plumose hairs brown. Scutum yellowish brown, with three shiny, brown vittæ; scutellum yellowish brown; other sclerites uniformly brown. Legs very delicate, slender, without pulvilli; empodium vestigial; tarsal segments of hind legs showing proportional lengths 45:24:17:10:8. Wings milky white, purplish by transmitted light, without anal lobe, very long, about five times as long as wide, veins very delicate and colorless. Venation: costa distinctly produced beyond tip of R_{4+5}, M_{3+4} ending far before tip of R_{4+5}, fMCu under r-m, Cu_1 almost straight and slightly undulated at tip. Halteres yellowish brown. Abdomen brown, with narrow, tergal, brown bands. Hypopygium (Plate 3, fig. 58) with anal point very small, semicircular, bare; coxites each with a small basal tubercle and a large, flat ventral lobe; styles small, pointed, each with a small dorsal ridge on basal area.

Female.—Body 2 to 2.7 mm long, yellow. Mesothoracic scutum with three brown vittæ; postscutellum and pleural sclerites brownish yellow. Antennæ elongate, 7-segmented (17 : 40 : 28 : 25 : 25 : 25 : 40), with very long trichoid sensillæ. Wings broader than in male; anal lobe obtuse. Abdomen yellow, each segment with a narrow, brown, tergal band on caudal margin; cerci with prominent ventral lobe.

Holotype.—Male; Arisan, Formosa; December 27, 1934.

Allotopotype.—Female; December 27, 1934.

Paratopotypes.—Males and female; December 27, 1934.

According to Edwards's system this species belongs to group A of *Smittia,* but vein Cu_1 is almost straight and is lightly sinuous only at tip. The *Tipula*-like appearance is quite characteristic of the species, greatly differentiating it from the brown species of the genus.

SPANIOTOMA (SMITTIA) ATERRIMA Meigen.

Male.—Thorax entirely black; scutum shiny. Abdomen dark brown. Head with eyes pubescent; antennæ black, with subapical bare area; antennal ratio 1.55 to 1.6. Legs without beards and pulvilli. Wings milky white. Venation: costa produced beyond end of R_{4+5}, the latter curved along costa on distal part and about twice R_1, R_{2+3} ending near tip of R_{4+5}, fMCu far beyond r-m, Cu_1 undulated, 1A beyond fMCu, curved downwards at tip; veins colorless; squama not very black. Halteres dark brown. Male hypopygium with anal point small, bare; coxites each with a small mesal lobe; styles each with a prominent preapical ridge (Plate 3, fig. 62).

Specimens.—Males; Omu, Kitami, Hokkaido; August, 1937.

SPANIOTOMA (SMITTIA) VESPARUM Goetghebuer.

Male and female.—Body entirely black; scutum mat. Wings milky white. Male antennal ratio about 1.7 to 1.8. Female antennæ with leaflike sensory organs.

Eyes pubescent; ultimate segment of male antennæ pubescent on basal half of distal nonplumose area; female antennæ 6-segmented (2.5 : 3.5 : 2.7 : 3 : 3 : 6), flagellar segments (Plate 3, fig. 61) with leaflike sensillæ. Legs without pulvilli. Wings with anal lobe large; squama not very dark. Venation: costa produced beyond tip of R_{4+5} fMCu beyond r-m, Cu_1 sinuous, 1A extending beyond fMCu and curved at tip. Halteres dark brown. Male hypopygium with anal point small, pubescent, needlelike; coxites each with a bare small lobe; styles flattened, with small

preapical concavity, dorsal ridge developed only on apical part (Plate 3, fig. 60).

Specimens.—Males and females; Sikuka, Sakhalin; July 17, 1938.

CHIRONOMINÆ

PENTAPEDILUM (PENTAPEDILUM) TUBERCULATUS sp. nov.

Male.—Body about 3.8 mm long; ground color dark brown. Mesoscutum with three shiny black vittæ which are separated by pale-brown stripes along foveæ. Wings with macrotrichia only at extreme tip. Halteres brown. Dorsal appendages of hypopygium flattened apically, each with a seta; ventral appendages each with a setigerous dorsal tubercle on apical end. Antennal ratio about 1. Foreleg ratio about 1.25.

Head dark brown, with eyes bare and elongated dorsad; mouths parts and frontal area brown. Antennæ 14-segmented, brown, with scapes black. Scutum with three black vittæ, caudoscutal area dark brown; scutellum brown; other sclerites black. Wings milky white, veins pale brown, anal lobe obtuse. Venation: R_{2+3} extending closely along R_1, fMCu far beyond base R_{4+5}, 1A atrophied at fMCu; macrotrichia only at distal end of R_5 and closely along distal margin in cell M_2. Legs mainly brown, coxæ black; pulvilli large; no beards on forelegs. Abdominal terga uniformly dark brown. Hypopygium with anal point slender, simple; styles short, oval, with distinct setæ on entire length of mesal side; dorsal appendages (Plate 3, fig. 70) nonpubescent, hyaline, dilated and flattened distally, each with a short seta; ventral appendages (Plate 3, fig. 64) straight, with strong setæ only on apical part, each with a characteristic setigerous tubercle on apical end.

Holotype.—Male; Kita-Hakutyo-ko, Karahuto; July 30, 1938.

Paratopotypes.—Males; July 30, 1938.

This species is highly distinct in the possession of the short terminal segments of the antennæ and the characteristic hypopygium.

PENTAPEDILUM (PHÆNOPSECTRA) KIZAKIENSIS sp. nov.

This species is very abundant in Kizaki-ko (Lake Kizaki), Nagano-Ken. The blood-red larvæ represent an important element in the benthal fauna of the lake. The immature stages have often been incorrectly reported in limnological papers as *Endochironomus* larvæ. The specimens examined were reared in the laboratory from the larvæ from the bottom of the lake.

Male and female.—Body about 4.5 to 5 mm long. Thorax and abdomen black, with white pruinescence. Legs brown. Male antennal ratio 2.3 to 2.4. Foreleg ratio 1.15 to 1.25.

Head without frontal tubercles; eyes bare. Antennæ of male 14-segmented, brown, scapes black; female antennæ 7-segmented (4: 4.5: 5: 7: 7: 6.5: 12). Mouth parts brown. Pronotum reduced, invisible in dorsal aspect. Legs with large pulvilli; forelegs of male with long beards. Wings mainly brown but somewhat yellowish on basal area, with macrotrichia rather thick on distal two-thirds, bare areas along veins distinct, veins brown. Venation: costa not produced beyond end of R_{4+5}, R_{2+3} extending very closely along R_1, fMCu under r-m; r-m and base of Rs dark. Halteres pale brown. Abdomen black; caudal margins of segments with somewhat whitish pruinescence. Male hypopygium black, much related to that of *P. punctipes* Wiedeman, figured by Goetghebuer; and anal point as long as ventral appendages, extending just beyond end of coxite, simple, very slightly clavate at tip; dorsal appendages (Plate 3, fig. 74) elongated, curved only at tip; ventral appendages straight, with branched featherlike bristles on distal part; styles thick, not distinctly narrowed apically, with marginal fringe of setæ on mesal side not restricted at tip.

Holotype.—Male; Kizaki-ko, Nagano-ken; March 25, 1931.

Allotopotype.—Female; March 25, 1931.

Paratopotypes.—Male and female imagines, pupæ, and larvæ; March, 25, 1931.

This species is closely related to *P. punctipes* Wiedeman, in which, however, the thorax is shiny black, the abdomen is shiny pale green, the male antennæ including plumose hairs and the legs are uniformly white, and the antennal ratio of the male is about 2. Another related species may be *P. flavipes* Meigen, in which the legs and the styles of the male hypopygium are pale yellow, the female antennæ are 6-segmented, and the dorsal appendages of the male hypopygium are arcuated and not curved at the tip (Goetghebuer's figure).

CHIRONOMUS (CHIRONOMUS) THUMINI Kieffer.

The adult flies were reared by Mr. Y. Ito from the larvæ which were collected from a hot spring (33.8° C.) at Zigoku-onsen, Kumamoto-ken.

Male.—Body about 4.9 mm, wings about 3.4 mm long. Thorax entirely black, slightly pruinose; abdominal terga dark

brown. Antennal ratio 2.4 to 2.5. Head with frontal tubercles small but distinct; antennæ 12-segmented. Legs brown, without beards on forelegs. Hypopygium dark brown, almost as in *C. dorsalis* Meigen; ultimate tergum with only two median setæ before base of anal point; dorsal appendages narrowed basally.

Larva.—Body length of full-grown larvæ about 10.2 mm. Mentum much as in *C. dorsalis*, but four pairs of lateral teeth subequal in shape and size. Labrum with six pairs of slender, featherlike, lateral appendages and a pair of simple, trichoid dorsomedian appendages; ventromedian appendages flat, elongate, oval, finely serrulated only on one edge.

Specimens.—Males and larvæ; Zigoku-onsen, Kumamoto-ken; January 17, 1938.

The imagines are darker than the European specimens and seem to represent a dark variety of the species.

CHIRONOMUS (CHIRONOMUS) CIRCUMDATUS Kieffer.

Chironomus (*Chironomus*) *circumdatus* KIEFFER, Ann. Hist.-Nat. Mus. Nation. Hung. 14 (1916) 110, 111.

Male and female.—Body about 5 mm long, yellowish white in ground color. Thorax with three orange-yellow vittæ, lateral margins of these vittæ dark; broad, dark, marginal rings of these vittæ in female. Abdominal terga two to five each with a round dark central cloud, in female abdominal terga brown, each with a large dark-brown cloud. Legs pale yellow; base of fore tibia dark brown. Male antennal ratio 3.3 to 3.6. Foreleg ratio about 1.76. Wings with base of radial branches somewhat dark brown. Dorsal appendages of male hypopygium as in Plate 4, fig. 80.

Specimens.—Males and females; Taihoku, Formosa; August 12 to 18, and September 1, 1937.

CHIRONOMUS (CHIRONOMUS) PRASINELLUS Kieffer.

Chironomus (*Chironomus*) *prasinellus* KIEFFER, Suppl. Ent. 1 (1912) 37, 38.

Male and female.—Body about 4.5 mm long in male and 4 mm long in female, almost entirely yellow. Mesothoracic scutum with three orange-yellow vittæ. Legs yellowish white, articulations between tarsal segments dark. Wings each with a small, dark, central cloud covering r-m. Male antennal ratio 2.7 to 3.3. Dorsal appendages of male hypopygium closely resembling those in *C. circumdatus* Kieffer.

Specimens.—Males and females; Taihoku, Formosa; August 12 to 18 and September 1, 1937.

Kieffer incorrectly stated that the dorsal appendage of the male hypopygium bears a small, apical, spinelike projection.

CHIRONOMUS (CHIRONOMUS) DYSTENUS Kieffer.

Chironomus (Chironomus) dystenus KIEFFER, Ann. Hist.-Nat. Mus. Nation. Hung. 14 (1916) 112.

Male.—Body 3.7 to 5 mm long. Thoracic ground color brown; scutum with three vittæ black, shiny. Abdominal terga dark brown. Halteres brown. Legs uniformly brown. Wings with veins pale brown, r-m slightly darker. Male antennal ratio 2.8 to 2.9. Foreleg ratio about 2.

Specimens.—Males; Taihoku, Formosa; August 12 to 18 and September 1, 1937.

The dorsal appendages of the male hypopygium (Plate 4, fig. 79) are bare but each is provided with a flat setigerous basal lobe on the ventral side.

CHIRONOMUS (CHIRONOMUS) NIPPONENSIS sp. nov.

Male and female.—Body about 7 mm long, almost entirely black. Thorax with shiny, black, scutal vittæ which are subconfluent or confluent. Legs brown, with dark markings, knee joints broadly black. Wings with r-m and base of R_{4+5} black. Halteres yellowish white. Male antennal ratio 1.45 to 1.6. Foreleg ratio 4.1 to 4.3. Male hypopygium with broad anal point which is provided with two dorsal lamellæ.

Head entirely dark brown, with frontal tubercules. Antennæ of female 6-segmented (5 : 11.3 : 9 : 9 : 7.5 : 14.9). Thorax almost black; scutum of female brownish black on caudoscutal area and along foveæ. Legs largely brown; coxæ, knee joints, bases of femora, distal ends of tibiæ, and distal ends of proximal three tarsal segments uniformly black; ultimate two tarsal segments dark brown; beards of forelegs absent. Wings with veins dark brown; fMCu under r-m. Abdomen black; caudal margin of each abdominal tergum pale brown. Male hypopygium with anal point broad, large; styles with mesal long setæ only on distal part; dorsal appendages (Plate 4, fig. 81) black, long, slightly arcuated, pointed at tip; ventral appendages with bristles branched or forked.

Holotype.—Male; Sikuka, Karahuto; August 18, 1938.

Allotopotype.—Female; August 18, 1938.

Paratopotypes.—Males and females; August 18, 1938.

This species somewhat resembles *C. dorsalis* Meigen, but the structure of the anal point and the shape of the dorsal appendages are notably different.

CHIRONOMUS (CHIRONOMUS) TRINIGRIVITTATUS sp. nov.

Male and female.—Body 6 to 7 mm long. Thoracic notum yellow, with three separated black vittæ on yellow scutum; postscutellum of male yellow, that of female orange yellow on anterior half and black on posterior half. Legs mainly yellow; fore tibiæ yellowish brown, tarsal segments of all legs brown. Wings with veins yellowish brown, stem of M, r-m and R_{4+5} black. Male antennal ratio about 3.5. Foreleg ratio about 1.5.

Head with frontal tubercles. Male antennæ brown, with scapes black; female antennæ yellow, 6-segmented. Legs with pulvilli large; beards of forelegs absent. Mesoscutum shiny, yellow, with three black vittæ; scutellum yellow; pleural side with a large black spot; sternal side black. Halteres yellowish white. Abdomen uniformly brown; caudal margin of each tergum narrowly pale brown. Hypopygium closely resembling that in *C. dorsalis* Meigen (Plate 4, fig. 78).

Holotype.—Male; Sikuka, Sakhalin; July 18, 1938.

Allotopotype.—Female; July 18, 1938.

Paratopotypes.—Males and females; July 18, 1938.

This species is very closely allied to *C. dorsalis* Meigen, in which, however; the male antennal ratio is less than 3 and the foreleg ratio is greater than 1:5.

CHIRONOMUS (CHIRONOMUS) FLAVIPLUMUS sp. nov.

Males.—Body about 5.5 mm long, yellowish white in ground color. Thorax pruinose, with three orange-yellow scutal vittæ. Abdomen yellowish white on anterior segments, yellowish pale-brown on caudal segments; tergal side of abdominal segments two to four each with a small, oval, dark, central spot.

Head with frontal tubercles. Antennal ratio about 3.5; scape yellow, flagellum brown, plume pale brownish yellow. Thoracic ground color yellowish white; scutum with three orange-yellow vittæ; postscutellum white on anterior half, orange-yellow on posterior half; other sclerites uniformly yellow. Legs yellow, without beards; distal ends of tarsal segments dark; foreleg ratio about 1.65. Wings with veins pale yellow; r-m dark; fMCu under r-m. Halteres white. Hypopygium yellowish brown, very closely resembling that in *C. dorsalis* Meigen, styles somewhat narrower on apical part.

Holotype.—Male; Saga, Kyoto; August 18, 1937.

Paratopotypes.—Male; August 18, 1937.

This species is very closely allied to *C. dorsalis* Meigen, in which, however, the antennal ratio is 2.9.

CHIRONOMUS (MICROTENDIPES) FUSCIPENNIS Meigen.

Male.—Body about 5 mm long. Thorax shiny black, scutellum yellowish brown. Wings uniformly pale yellow. Halteres black. Legs yellow. Abdominal segments one to five yellow, six to nine black. Antennal ratio hardly greater than 1. Foreleg ratio about 1.4.

Head without frontal tubercles. Antennæ mainly brown, with scapes black. Legs yellow, coxæ dark brown, fore femora black on distal two-thirds, fore tibiæ narrowly black at tip; pulvilli present. Styles of hypopygium elongated; dorsal appendages (Plate 3, fig. 65) yellow, slender, clavate at tip, with a seta at middle; ventral appendages slender, with an apical seta.

Specimens.—Males; Titori, Karahuto; August 3, 1938.

CHIRONOMUS (MICROTENDIPES) KARAFUTONIS sp. nov.

Male and female.—Body 2.5 to 3 mm long, entirely white. Scutum with pale-yellow shiny vittæ. Male antennal ratio about 7. Foreleg ratio about 1.4. Male hypopygium with broad dorsal appendages.

Head without frontal tubercles. Antennæ yellow, those of female 6-segmented, those of male 14-segmented. Wings with only four squamal setæ, veins pale yellow; R_{2+3} extending very closely to R_1; R_{4+5} ending almost at tip of wing. Legs with very small pulvilli; no beards on forelegs. Male hypopygium with anal point simple, very slender; styles large, thick, with dorsal ridge on basal half; dorsal appendages (Plate 3, fig. 66) broad, each with two setæ; ventral appendages straight, with many bristles on distal part only.

Holotype.—Male; Toyohara, Sakhalin; August 6, 1938.

Allotopotype.—Female; August 6, 1938.

Paratopotypes.—Males; August 6, 1938.

This species is allied to *C. diffinis* Edwards, in which, however, the dorsal appendages of the male hypopygium are slenderer, the anterior five segments of the abdomen are green, the remaining segments dark, and the postscutellum and thoracic sternum black.

CHIRONOMUS (MICROTENDIPES) YAMASINENSIS sp. nov.

This species is very common along the drainage of Lake Biwa. The specimens examined were reared from the larvæ collected from the bottom of the drainage.

Male and female.—Body 4 to 6 mm long, yellowish brown in ground color, with white pruinescence. Male antennal ratio about 1.1. Male with long beards on forelegs; foreleg ratio 1.1 to 1.2. Abdominal tergum with three brown clouds on anterior part and two large pruinose areas on posterior part.

Head with eyes bare. Antennæ pale brown, scapes yellow; in female antennæ 6-segmented (5 : 12 : 8 : 8 : 7 : 13), intermediate flagellar segments each with a long neck region, ultimate segment with five preapical setæ. Thorax with three reddish-brown vittæ on scutum, broadly pruinose along foveæ, with a median dark-brown stripe on anterior half of scutum; scutellum yellowish brown; postscutellum brown on anterior half, yellowish brown on posterior half; other thoracic selerites yellowish brown. Legs yellow, with brown clouds; pulvilli present; coxæ yellowish brown; femoral base and tip, tibial distal end, and basal area beyond extreme base broadly brown; distal half of third tarsal segment and two distal segments of foreleg, distal half of proximal three tarsal segments, and two distal segments of middle and hind legs uniformly brown. Wings uniformly brown, veins yellowish brown; R_{2+3} extending closely along R_1; r-m dark brown in female and brown in male. Halteres yellow. Tergum of first abdominal segment with a pair of brown clouds; other segments with three brown clouds on tergal side; ultimate two segments of female entirely brown. Male hypopygium brown; anal point simple, needlelike, elongated, extending beyond coxites; styles swollen basally, narrowed on apical half, with long bristles on apical part; dorsal appendages (Plate 3, fig. 72) elongated, arcuated, with three setæ on middle part; ventral appendages (Plate 3, fig. 69) compressed, with three long setæ on apical end, strong bristles on entire length of dorsal side, and each with a dorsal setigerous tubercle on apical part.

Holotype.—Male; Yamashina, Kyoto; October 11, 1935.

Allotopotype.—Female; October 11, 1935.

Paratypes.—Males, and female imagines, pupæ, and larvæ; Yamashina and Kumano, Kyoto; October 11, 1935, and August 27, 1936.

This species is somewhat related to *C. confinis* Meigen, in which, however, the male antennal ratio is about 2, the abdominal terga two to five are each provided with a basal dark band, terga six to eight are entirely black, the anal point of the male hypopygium ends before the tip of the coxite, the styles

are oval and not distinctly narrowed apically, and the ventral appendages are normal, not compressed and not tuberculated.

CHIRONOMUS (POLYPEDILUM) NUBECULOSUS Meigen.

Male and female.—Body about 6 mm long in male and 4 mm long in female. Thorax shiny black. Wings with two dark clouds in cell R_5. Male antennal ratio about 1. Foreleg ratio about 1.55.

Head black, appendages brown. Male antennæ 14-segmented; female antennæ yellow, 6-segmented (5:10:6.5:7:5:29). Thorax with pale stripes along foveæ. Legs mainly yellow, coxæ black; no distinct beards on forelegs. Wings with veins yellowish pale brown, with several dark clouds; one at base of cell R_5, one beyond middle of cell R_5 which extends at tip R_{4+5}, one in cell M_1, one faint cloud along caudal margin of vein M_{1+2}, two faint clouds in anal cell. Halteres dark brown. Abdomen black; anal point of male hypopygium needlelike; dorsal appendages (Plate 3, fig. 73) elongated, almost straight, curved only at tip, with a long seta; ventral appendages straight, with a long apical seta; styles elongated, oval.

Specimens.—Males and females; Azabu, Tokyo, and Toyohara, Karahuto; May 10, 1937, and July 31, 1938.

CHIRONOMUS (POLYPEDILUM) TRINIMACULUS sp. nov.

Male and female.—Body 2.7 to 3.5 mm long. Scutum shiny black, somewhat paler along foveæ; humeral areas yellowish brown. Wings each with three dark clouds: one in cell R_5, one in cell M_4, and one in anal cell. Male antennal ratio about 1.48. Foreleg ratio about 1.45.

Male antennæ 14-segmented; female antennæ 6-segmented (4:9:5.5:6.5:5:11). Thorax almost entirely black; scutum with black, shiny, subconfluent vittæ; scutellum yellowish brown. Legs with coxæ black; in male other segments all pale brown; in female tibiæ of forelegs, bases of femora of all legs, and tarsal segments of all legs yellowish pale brown, tibiæ of middle and hind legs and femora of all legs black. Wings (Plate 3, fig. 42) with three dark clouds: one in base of cell R_5 (in male extreme base of cell R_5), one in base of cell M_4 covering vein Cu_1, and one at middle of anal cell; fMCu beyond r-m. Halteres pale brown in male and black in female. Abdominal terga uniformly dark.

Holotype.—Female; Toyohara, Sakhalin; August 5, 1938.

Allotopotype.—Male; August 5, 1938.

Paratypes.—Females; August 5, 1938.

The female of this species is closely related to *C. ægyptium* Kieffer, in which, however, the halteres are white in the female and the foreleg ratio is about 2. The male of this species is related to *C. flugidum* Kieffer, in which, however, the halteres and legs of the male are dark brown and the fork between veins M_{3+4} and Cu_1 is situated under r-m.

CHIRONOMUS (GLYPTOTENDIPES) PARIPES Edwards.

Male and female.—Body 6.5 to 7.5 mm long, black in ground color. Thorax black, heavily dusted with gray. Legs entirely black; forelegs with long beards; second and third tarsal segments of forelegs subequal in length. Abdominal segments with distinct tergal raquet-shaped impression.

Head with small frontal tubercles, in female tubercles very small. Male antennal ratio about 4.6; female antennæ 7-segmented (5:5:6:7:7.5:8:14). Tarsal segments of forelegs with proportional lengths 122:58:55:49:24; foreleg ratio about 1.35. Wings white, with dark-brown veins; vein M_{1+2} dark brown on basal half, colorless on distal half; r-m and base of R_{4+5} black. Halteres pale brown. Abdomen black, caudal margin of each abdominal tergum heavily dusted with gray. Male hypopygium with anal point slender, long, clavate distally; styles elongated; dorsal appendages (Plate 4, fig. 77) elongated, strongly curved distally; ventral appendages straight, with simple bristles.

Specimens.—Males and females; Sikuka, Sakhalin; August 18, 1938.

The British specimens are somewhat different in the following points: the wings are strongly milky white and have vein M_{1+2} entirely pale as in Cu_1 and M_{3+4}, the male antennal ratio is only 4, and the foreleg ratio is 1.25.

CHIRONOMUS (GLYPTOTENDIPES) GRIPEKOVENI Kieffer.

Male and female.—Body 7 to 8 mm long. Scutum heavily pruinose, yellowish brown in ground color, with dark-brown vittæ. Legs mainly yellowish brown, knee joints dark. Male antennal ratio 3.35 to 3.42. Foreleg ratio 1.6 to 1.7.

Head without frontal tubercles. Female antennæ 7-segmented (5:7:6.5:7:7:6.5:12). Thorax heavily pruinose, yellowish brown in ground color; scutum with median vitta dark brown and lateral vittæ black; pronotum and scutellum brownish yellow; postscutellum black; pleural membranes yellowish brown.

Coxæ of middle and hind legs dark brown, those of forelegs yellowish brown; other segments extensively yellowish brown, knee parts broadly dark brown; knee articulations somewhat paler; femora and tibiæ of female darker than in male; tarsal segments dark at tip; ultimate two tarsal segments brown. Forelegs without beards, with proportional lengths of tarsal segments 128 : 60.3 : 54 : 46.3 : 20.7. Wings with veins uniformly dark brown, r-m not darker than other veins; R_{2+3} extending parallel to R_1; fMCu under r-m. Halteres pale brownish white. Abdomen with distinct, dorsal, segmental impression; tergal side dark brown, somewhat paler along posterior margin of each tergum. Male hypopygium (Plate 4, fig. 76) closely resembling that in *C. paripes* Edwards, but styles thicker and with larger dorsal ridge.

Specimens.—Males and females; Saga, Kyoto; August 18 and 19, 1937.

CHIRONOMUS (STICTOCHIRONOMUS) AKIZUKII sp. nov.

Male and female.—Body about 5 mm long, mainly black. Thorax black, pruinose along foveæ. Abdomen black; caudal margin of each abdominal tergum strongly pruinose. Legs with distinct black and yellow markings. Wings each with a black central spot covering r-m. Male antennal ratio about 2.5. Foreleg ratio about 1.4.

Head with eyes bare. Male antennæ entirely black, 14-segmented; female antennæ yellow, with two apical setæ, 6-segmented (4 : 8 : 6.5 : 7 : 7 : 12). Thorax black, with white pruinescence along foveæ; scutum with a small hump at middle. Legs with coxæ, trochanters, and femora mainly black; femora each with a narrow yellow ring before distal end; tibiæ broadly black on both ends, yellow on middle part, with a black ring at middle; basal three tarsal segments yellow, distal ends of these segments black; other tarsal segments uniformly brown; no beards on foreleg; pulvilli as long as claws. Wings with veins yellow, each with a distinct black central spot covering base of R_{4+5} and r-m; R_{2+3} ending slightly before middle between tips of R_1 and R_{4+5}; fMCu just before r-m. Halteres yellowish white. Abdomen black, with white pruinescence on caudal margin of each tergum. Female cerci dark brown; male hypopygium mainly black, distal half of styles yellowish brown; dorsal appendages (Plate 3, fig. 71) black, strongly curved on apical part, each with a seta; ventral appendages straight, with

strong bristles almost on entire length of dorsal side and each with an apical long seta; styles elongated, subcylindrical, with many small hairs on apical half; anal point simple, long.

Holotype.—Male; Toyohara, Sakhalin; August 6, 1938.

Allotopotype.—Female, August 6, 1938.

Paratypes.—Males and females; Wakasugiyama, Hukuoka-ken; March 29 and 30, 1930; Wakayama, Wakayama-ken; March 20, 1935; Azabu, Tokyo; April 15, 1936; and Toyohara, Sakhalin; August 6, 1938.

This species is closely allied to *C. histrio* Fabricius, in which, however, the black tibial middle rings are only found on the hind legs, and the apical setæ of the ventral appendages of the male hypopygium are absent.

CHIRONOMUS (LIMNOCHIRONOMUS) LOBIGER Kieffer.

Male and female.—Body about 5 mm long in male and 4 mm long in female. Thorax with yellow vittæ on white scutum. Legs mainly yellow; fore tibiæ black; first tarsal segments of forelegs white, with distal third black. Halteres white. Antennal ratio of male 2.85. Foreleg ratio about 1.5.

Head with frontal tubercles; eyes bare. Antennæ yellowish pale brown, 12-segmented in male, 6-segmented in female. Thoracic sclerites mainly yellow; scutum with yellow vittæ separated by white stripes along foveæ; scutellum white. Legs mainly yellow; distal third of first tarsal segments and distal four tarsal segments all black; in foreleg, tibia black and basal two-thirds of first tarsal segment white; pulvilli large. Wings with veins all yellow; R_{2+3} extending along R_1, fMCu just beyond r-m. Abdomen yellow. Male hypopygium (Plate 3, fig. 68) with anal point simple, long; styles strongly arcuated, slender, with setæ of mesal side only at distal end; dorsal appendages large, setigerous, somewhat swollen apically; ventral appendages very slender, strongly clavated and curved at distal end, with bristles only on apical part.

Specimens.—Males and females; Sikuka, Sakhalin; July 18, 1938.

According to Edwards the European specimens are somewhat different from our specimens in the following points: the fore femora are slightly darker apically, the dorsal appendages of the male hypopygium are much slenderer, forming beaklike projections at the end, and setigerous only at tip, and the ventral appendages are more or less conspicuously bilobed.

CHIRONOMUS (CRYPTOCHIRONOMUS) SAUTERI Kieffer.

Chironomus (Cryptochironomus) sauteri KIEFFER, Philip. Journ. Sci. 18 (1921) 583, 584.

Male and female.—Body about 2.5 mm long in male and 2 mm long in female, almost entirely yellow. Mesoscutum with three orange-yellow vittæ; postscutellum also orange-yellow, with a pair of dark clouds. Abdomen yellow, with caudal five segments yellowish pale brown. Legs yellow; forelegs with tibiæ and tarsi dark brown; first tarsal segment of foreleg broadly white on basal part. Wings with all veins hyaline, without dark cross-vein. Male antennal ratio 1.9 to 2.1. Foreleg ratio about 1.8.

Head without frontal tubercles. Male antennæ 12-segmented, scape dark, flagellum brown, plume yellowish white; female antennæ 6-segmented (15:26:14:14:16:44), ultimate segment subequal to preceding three segments together, intermediate flagellar segments without neck region, with long sensillæ. Wing with fork between M_{3+4} and Cu_1 beyond basis of radial branches. Male hypopygium with anal point long, slender, extending at middle of styles; styles slender, long, strongly arcuated; dorsal appendages (Plate 4, fig. 82) slender, straight, arising from end of coxite, each with three setæ on apical part.

Specimens.—Males and females; Taihoku, Formosa; August 12 to 18, 1937.

Kieffer has described only the female imago.

CHIRONOMUS (CRYPTOCHIRONOMUS) VIRIDULUS Fabricius.

Male.—Body about 3.5 mm long, yellow in ground color. Thoracic scutum with three black shiny vittæ; postscutellum reddish brown on anterior half and black on posterior half. Hypopygium with neither dorsal nor ventral appendages. Antennal ratio about 2.5. Foreleg ratio about 1.6.

Head with frontal tubercles very small. Antennæ brown, scapes black, 12-segmented. Scutum with three black vittæ and a small median hump; sternal side black; pleural side with a large black spot under base of wing. Legs mainly yellowish brown; forelegs brownish black; pulvilli large; empodium vestigial. Wings with veins yellowish brown; R_{2+3} extending parallel to R_1, fMCu beyond r-m not darker. Halteres yellow. Abdomen brown on tergal side. Hypopygium with subtriangular broad anal point (Plate 3, fig. 75); styles slender, slightly arcuated, with ventral lamella, apical setæ only two.

Specimens.—Males; Sikuka, Sakhalin; July 18, 1938.

CHIRONOMUS (PROCHIRONOMUS) BIFASCIPENNIS sp. nov.

Male and female.—Body about 2 mm long in male and 1.5 mm long in female, dark brown in ground color. Wings each with two dark broad bands; squama bare. Male hypopygium with ventroproximal appendages.

Antennæ of male 14-segmented; antennal ratio about 0.91; those of female 6-segmented (14:30:19:19:18:30). Head, thorax, and abdomen dark brown; mesoscutum with subconfluent dark vittæ. Legs with coxæ dark brown, femora broadly dark on apical part, other segments white; fore tibiæ without spur; middle and hind tibiæ each with two confluent combs, each of which carries a spur; empodium vestigial; claws simple; beards of forelegs and pulvilli absent; foreleg ratio about 1.21. Wing (Plate 3, fig. 41) with two large dark bands, squama bare; cells R_1 and R_3 very narrow; veins brown, R_{2+3} and r-m obscure. Halteres white. Male hypopygium (Plate 3, fig. 67) white, anal point slender; dorsal appendages swollen and setigerous basally, pointed and curved apicaly; ventral appendages short, straight, with curved bristles on apical part; ventroproximal appendages with stem very short, each consisting of a tuft of simple setæ; styles normal, almost straight.

Holotype.—Male; Sizyukei, Formosa; December 29, 1934.

Allotopotype.—Female; December 29, 1934.

This species is very closely related in coloration to *Paratendipes nigrofasciatus* Kieffer which, however, is provided with a spur on the fore tibia, an important character of *Parathendipes*.

CHIRONOMUS (PROCHIRONOMUS) NIGERARTICULUS sp. nov.

Female.—Body about 2.7 mm long, almost entirely yellowish white. Fore tibiæ without spines; larger comb of hind tibia without spur, smaller comb with a long spur; pulvilli absent; third and fourth tarsal segments of foreleg subequal in length.

Head without frontal tubercles, with a small brown spot on vertex. Antennæ 6-segmented (17:38:25:28:31:49); intermediate flagellar segments each with a short neck region. Scutum with a small brown cloud on anterior margin, a larger brown cloud on either lateral margin; postnotum with a small brown cloud on posterior margin; pleural side with three small brown clouds under base of wing, sternal episternum with two small brown bands; pronotum much as in *Stenochironomus*. Legs white; knee joints, distal ends of tibiæ, and tarsal segments black; proportional lengths of segments of forelegs 62:54:71:

36 : 32 : 32 : 10; foreleg ratio about 1.31. Wings with veins pale yellow; squama fringed. Venation: R_{4+5} ending almost at tip of wing, R_{2+3} extending parallel to R_1, r-m very short and obscure, fMCu far beyond r-m. Abdomen entirely yellowish white.

Holotype.—Female; Taihoku, Formosa; December 26, 1934.

Paratopotypes.—Females; December 26, 1934.

This species is somewhat allied to *C. formosanus* Kieffer, which, however, has the thorax provided with three reddish-brown vittæ, the foreleg ratio about 1.5, and the abdomen entirely reddish brown.

TANYTARSUS (TANYTARSUS) FORMOSANUS Kieffer.

Tanytarsus (Tanytarsus) formosanus KIEFFER, Suppl. Ent. 1 (1912) 42, 43.

Male.—Body 2.7 to 3 mm long, yellow in ground color. Thorax shiny, with four dark-brown vittæ on yellow scutum. Abdominal segments one to five yellow, each tergum with a dark, somewhat inverted, T-shaped band on caudal margin; other segments including hypopygium yellowish pale brown. Wings and hypopygium much as in *T. uraiensis* Tokunaga.

Head with frontal tubercles. Antennæ 14-segmented, with scapes dark brown; flagellum including plumose hairs brownish yellow; antennal ratio about 1.1. Thorax shiny; mesoscutum yellow, with median vittæ brown or dark brown, lateral vittæ black; scutellum yellow; postscutellum black; pleural sides brown; sternal side dark brown. Legs with coxæ brown; other segments yellowish white; foreleg ratio about 2.3; forelegs with short tarsal beards; pulvilli absent. Halteres pale brownish yellow. Wings as in *T. uraiensis*, macrotrichia only on distal areas of cells R_5 and M_2, fMCu just beyond r-m. Hypopygium as in *T. uraiensis*, anal point with dotlike impression; dorsal appendages (Plate 4, fig. 83) setigerous, each with several long setæ on mesal margin; accessory lobe indistinct; ventroproximal appendages short, each with a tuft of simple setæ on apical end.

Female.—Body about 1.7 mm long, almost entirely pale brownish yellow. Scutum of mesothorax with brown or dark-brown vittæ. Abdomen almost entirely yellow, with trace of colored markings. Wings with thick macrotrichia, central area extensively bare.

Specimens.—Males and females; Taihoku, Formosa; August 12 to 18, and September 1, 1937.

Kieffer inadequately described and figured this species, representing the anal point of the male hypopygium as simple and

the dorsal appendages slender on the apical part and without setæ.

TANYTARSUS (TANYTARSUS) THERMÆ sp. nov.

This species is very abundant about hot springs (29° C. and pH 7) at Towada, Aomori-ken.

Male and female.—Body length about 2.2 to 2.6 mm. Ground color yellowish white; thorax with three brown vittæ. Male antennal ratio 0.85 to 0.95. Foreleg ratio 2.1 to 2.2.

Eyes bare, as widely separated on dorsal side as half of vertical length of eyes. Antennæ of male yellowish brown, with scapes pale reddish brown, 14-segmented; female antennæ 6-segmented. Thorax yellowish white; mesoscutum with three brown vittæ, median vitta subdivided by a median line of pale punctures, somewhat paler than lateral vittæ and rarely obscure; postscutellum and sternal side brown; pleural side with two small brown clouds under base of wing; in female and sometimes in male colored markings of thorax yellowish pale brown. Legs without pulvilli and beards; tibial combs of posterior legs distinctly separated from one another, each with a spur. Wings closely as in *T. kyotoensis* Tokunaga but wing cells R_1 and R_3 narrower and vein R_{2+3} obliterated. Male hypopygium also closely allied to that of *T. kyotoensis*, with anal point slender, long, and simple; dorsal appendages (Plate 4, fig. 86) somewhat square, setigerous, without accessory lobe; ventroproximal appendages long, fully as long as ventral appendages, curved dorsad at tip, expanded into two flat lobes at end; styles elongated, narrowed on distal one-third. Female cercus somewhat rhombic.

Holotype.—Male; Tuta-onsen, Aomori-ken; October 14, 1935.

Allotopotype.—Female; October 14, 1935.

Paratypes.—Males and females; Tuta-onsen and Kuzu-onsen, Aomori-ken; October 14, 1935, and October 27, 1938.

This species is closely allied to *T. kyotoensis* Tokunaga. Another related species may be *T. tenellullus* Goetghebuer, which, however, is provided with a small accessory lobe of the dorsal appendage on the male hypopygium and with a foreleg ratio less than 2.

TANYTARSUS (CLADOTANYTARSUS) VAN-DER-WULPI Edwards.

Male.—Body about 2.5 mm long, almost entirely yellowish white. Thorax with three shiny, black vittæ on yellow scutum. Antennal ratio about 1. Foreleg ratio about 2.1. Wings with

macrotrichia only on distal tip of cell R_5 and closely along distal margin in cell M_2.

Eyes bare, reniform. Antennæ 14-segmented, scapes black. Thorax with a dark pleural spot under base of wing; postscutellum and sternal side black; scutellum reddish brown. Legs without beards on forelegs; no pulvilli; tibial combs of posterior legs separated, each with a spur. Wings with veins hyaline; R_{2+3} ending at middle between tips of R_1 and R_{4+5}; fMCu far beyond r-m; macrotrichia restricted only at extreme tip of wing; lobe of wing round. Hypopygium (Plate 4, fig. 85) with anal point small and many minute dots on basal excavated area; styles small, not distinctly narrowed apically; dorsal appendages swollen on basal half, with three or four setæ, accessory lobe longer than dorsal appendage, slender; ventral appendages short, stout, sparsely setigerous only on apical part; ventroproximal appendages short, each with a large tuft of flat and forked setæ.

Specimens.—Males; Toyohara, Sakhalin; August 31, 1938.

TANYTARSUS (MICROPSECTRA) PRÆCOX Meigen.

Male and female.—Body 4 to 4.3 mm long. Thorax brown in ground color; male with four subconfluent, dark-brown, scutal vittæ; female with four separated black vittæ. Male antennal ratio about 1. Foreleg ratio about 1.75.

Head brown, mouth parts pale brown; eyes bare, widely separated on dorsal side. Antennæ of male 14-segmented, with scapes dark brown, other parts pale brown. Maxillary palpus 5-segmented (2:3:11:11:22). Thoracic notum moderately shiny, scutum with two dark-brown median and two black lateral vittæ; humeral areas yellowish; pleural and sternal sides reddish brown; membranous areas yellow. Legs unicolored, brown or pale brown, without beards and pulvilli. Wings hairy all over surface; fMCu under r-m. Male hypopygium with anal point short; dorsal appendages broad, with several setæ on mesal side; accessory lobes very slender, small, not visible in dorsal aspect; ventroproximal appendages with spoon-shaped hairs on distal part.

Specimens.—Males and females; Mount Hiei, Kyoto, March 17, 1935.

In the Japanese specimens the ultimate segment of the male antenna is comparatively short, the antennal ratio being only 1, while in the European specimens the ultimate segment is longer, the antennal ratio being about 1.5.

TANYTARSUS (MICROPSECTRA) SUBVIRIDIS Goetghebuer.

Male.—Body about 3.8 mm long, yellow in ground color. Thorax with four yellowish pale-brown vittæ on scutum. Antennal ratio 1.1 to 1.2. Foreleg ratio about 1.73. Hypopygium closely resembling that in *T. præcox* Meigen.

Head yellow, without frontal tubercles; eyes bare, distance between eyes on dorsal side about half vertical length of eyes. Mouth parts yellow, with maxillary palpi 5-segmented (2:4:10:11:19). Antennæ pale brown, 14-segmented. Mesoscutal vittæ yellowish, separated; postscutellum and pleural and sternal sclerites yellowish pale brown; scutellum and pleural membranes yellowish white. Wings as in *T. præcox*. Halteres white. Legs pale brownish yellow, without beards and pulvilli; tibial combs of posterior legs large, confluent, without spurs; relative lengths of segments 75:52:90:46:36:27:13 in foreleg; 85:79:55:34:26:16:9 in hind leg. Abdomen white; posterior margins of anterior segments and entire tergal side of posterior segments pale brownish yellow.

Specimens.—Males; Kamikoti, Nagano-ken; July 19, 1932.

As described above, these Japanese specimens are all paler than the European specimens, in which the thorax and abdomen are green, with dark-brown markings instead of the yellowish markings of the Japanese specimens. This paler coloration of our specimens seems to represent a character of a local variety.

TANYTARSUS (MICROPSECTRA) SHINAENSIS sp. nov.

Male.—Body about 3.6 mm long, brown in ground color. Thorax shiny brown, with four subconfluent dark vittæ on scutum; scutellum brown. Antennal ratio about 0.81. Foreleg ratio about 1.63.

Head brown or reddish brown; eyes bare, strongly curved; distance between eyes greater than half of vertical lengths of eyes (8:13). Antennæ brown, with scapes dark brown; segmentation between ultimate two segments incomplete. Thorax with median vittæ reddish brown, lateral vittæ dark brown; scutellum and pleural sides brown; postscutellum and sternal side dark brown. Wings with macrotrichia thick; R_{2+3} obscure, ending before middle between tips of R_1 and R_{4+5}; r-m long, about thrice length of basal section of R_{4+5}; fMCu under r-m. Halteres white. Legs uniformly pale brown, pulvilli vestigial, empodium as long as claws; proportional lengths of segments 70:48:78:39:29:20:11 in foreleg; 84:75:50:31:24:16:10 in hind leg. Abdomen pale brown; hypopygium with anal point

small, excavated dorsally on basal part; dorsal appendages (Plate 4, fig. 84) subtriangular, broad and pubescent basally, beaklike and bare apically, without accessory lobes; ventral appendages straight, with curved bristles on distal two-thirds; ventroproximal appendages pubescent on stem, with spoon-shaped hairs on apical part; styles large, not distinctly narrowed apically.

Holotype.—Male; Kamikoti, Nagano-ken; July 19, 1932.

This species is somewhat allied to *T. monticola* Edwards in coloration, but in the allied species the antennal ratio is only 0.6, the leg ratio 1.5, and the hypopygium distinctly different from that of the present species, especially in the structure of the anal points and ventroproximal appendages.

ILLUSTRATIONS

Plate 1

Fig. 1. *Atrichopogon* (*Atrichopogon*) *minimus* Kieffer, female wing.
2. *Atrichopogon* (*Atrichopogon*) *femoralis* sp. nov., female wing.
3. *Atrichopogon* (*Atrichopogon*) *rostratus* Winnertz, female wing.
4. *Atrichopogon* (*Atrichopogon*) *flavens* sp. nov., male wing.
5. *Atrichopogon* (*Atrichopogon*) *marginipilus* sp. nov., male wing.
6. *Atrichopogon* (*Kempia*) *longiserra* Kieffer, female wing.
7. *Atrichopogon* (*Kempia*) *brunnipes* Meigen, female wing.
8. *Atrichopogon* (*Kempia*) *maritimus* sp. nov., female wing.
9. *Atrichopogon* (*Kempia*) *japonicus* sp. nov., female wing.
10. *Atrichopogon* (*Kempia*) *pilosipennis* sp. nov., female wing.
11. *Atrichopogon* (*Kempia*) *pilosipennis* sp. nov., male wing.
12. *Ceratopogon* (*Trishelea*) *abdominalis* sp. nov., female wing.
13. *Ceratopogon* (*Isohelea*) *albitarsis* sp. nov., female wing.
14. *Ceratopogon* (*Isohelea*) *flaviventris* Kieffer, male wing.
15. *Ceratopogon* (*Isohelea*) *minimus* Kieffer, female wing.
16. *Ceratopogon* (*Isohelea*) *monticolus* sp. nov., male wing.

Plate 2

Fig. 17. *Ceratopogon* (*Isohelea*) *basiflagellatus* sp. nov., female wing.
18. *Ceratopogon* (*Isohelea*) *basiflagellatus* sp. nov., male wing.
19. *Alluaudomyia quinquepunctata* sp. nov., female wing.
20. *Alluaudomyia undecimpunctata* sp. nov., male wing.
21. *Alluaudomyia sagaensis* sp. nov., female wing.
22. *Monohelea* (*Monohelea*) *tessellata* Zetterstedt, female wing.
23. *Johannsenomyia shibuyai* sp. nov., male wing.
24. *Pentaneura circumdata* sp. nov., female wing.
25. *Pentaneura pleuralis* sp. nov., female wing.
26. *Atrichopogon* (*Atrichopogon*) *rostratus* Winnertz, male, style.
27. *Atrichopogon* (*Atrichopogon*) *parviforceps* sp. nov., male style.
28. *Atrichopogon* (*Atrichopogon*) *flavens* sp. nov., male style.
29. *Atrichopogon* (*Atrichopogon*) *femoralis* sp. nov., male style.
30. *Atrichopogon* (*Kempia*) *spiniventris* sp. nov., female abdominal processes.
31. *Atrichopogon* (*Kempia*) *pilosipennis* sp. nov., female abdominal processes.
32. *Atrichopogon* (*Kempia*) *maritimus* sp. nov., female claw.
33. *Atrichopogon* (*Kempia*) *pilosipennis* sp. nov., male style.
34. *Atrichopogon* (*Kempia*) *maritimus* sp. nov., male style.
35. *Stilobezzia albicornis* Kieffer, female distal two tarsal segments.
36. *Atrichopogon* (*Kempia*) *spiniventris* sp. nov., male style.
37. *Atrichopogon* (*Kempia*) *clavifuscus* sp. nov., male style.

FIG. 38. *Atrichopogon* (*Kempia*) *yoshimurai* sp. nov., male style.
39. *Atrichopogon* (*Kempia*) *kagiensis* sp. nov., male style.
40. *Atrichopogon* (*Kempia*) *brunnipes* Meigen, male style.

PLATE 3

FIG. 41. *Chironomus* (*Prochironomus*) *bifascipennis* sp. nov., female wing.
42. *Chironomus* (*Polypedilum*) *trimaculus* sp. nov., male wing.
43. *Johannsenomyia shibuyai* sp. nov., male hypopygium.
44. *Procladius* (*Procladius*) *karahutoensis* sp. nov., male style.
45. *Ceratopogon* (*Isohelea*) *falcifer* sp. nov., male style.
46. *Atrichopogon* (*Kempia*) *kyotoensis* sp. nov., male style.
47. *Ceratopogon* (*Isohelea*) *basiflagellatus* sp. nov., male style.
48. *Ceratopogon* (*Isohelea*) *monticolus* sp. nov., male maxillary palpus.
49. *Ceratopogon* (*Isohelea*) *minimus* Kieffer, male maxillary palpus.
50. *Ceratopogon* (*Isohelea*) *monticolus* sp. nov., male style.
51. *Atrichopogon* (*Kempia*) *akizukii* sp. nov., male style.
52. *Pentaneura pleuralis* sp. nov., male style.
53. *Cricotopus tremulus* Linnæus, male style and mesal lobe of coxite.
54. *Cricotopus bituberculatus* sp. nov., male style and mesal lobe of coxite.
55. *Cricotopus nitens* (Kieffer), male style and mesal lobe of coxite.
56. *Cricotopus trifascia* Edwards, male style.
57. *Spaniotoma* (*Orthocladius*) *multiannulata* sp. nov., male style.
58. *Spaniotoma* (*Smittia*) *tipuliformis* sp. nov., male coxite and style.
59. *Spaniotoma* (*Limnophyes*) *fuscipygma* sp. nov., male style and mesal lobe of coxite.
60. *Spaniotoma* (*Smittia*) *vesparum* Goetghebuer, male style and mesal lobe of coxite.
61. *Spaniotoma* (*Smittia*) *vesparum* Goetghebuer, female third antennal segment.
62. *Spaniotoma* (*Smittia*) *aterrima* Meigen, male style and mesal lobe of coxite.
63. *Spaniotoma* (*Orthocladius*) *multiannulata* sp. nov., female cercus.
64. *Pentapedilum* (*Pentapedilum*) *tuberculatus* sp. nov., male ventral appendage of hypopygium.
65. *Chironomus* (*Microtendipes*) *fuscipennis* Meigen, male dorsal appendage of hypopygium.
66. *Chironomus* (*Microtendipes*) *karafutonis* sp. nov., male dorsal appendage of hypopygium.
67. *Chironomus* (*Prochironomus*) *bifascipennis* sp. nov., male appendages of hypopygium.
68. *Chironomus* (*Limnochironomus*) *lobiger* Kieffer, male dorsal and ventral appendages of hypopygium.
69. *Chironomus* (*Microtendipes*) *yamasinensis* sp. nov., male ventral appendage of hypopygium.
70. *Pentapedilum* (*Pentapedilum*) *tuberculatus* sp. nov., male dorsal appendage of hypopygium.
71. *Chironomus* (*Stictochironomus*) *akizukii* sp. nov., male dorsal appendage of hypopygium.

FIG. 72. *Chironomus* (*Microtendipes*) *yamasinensis* sp. nov., male dorsal appendage of hypopygium.
73. *Chironomus* (*Polypedilum*) *nubeculosus* Meigen, male dorsal appendage of hypopygium.
74. *Pentapedilum* (*Phænopsectra*) *kizakiensis* sp. nov., male dorsal appendage of hypopygium.
75. *Chironomus* (*Cryptochironomus*) *viridulus* Fabricius, male anal point of hypopygium.

PLATE 4

FIG. 76. *Chironomus* (*Glyptotendipes*) *gripekoveni* Kieffer, male dorsal appendage of hypopygium.
77. *Chironomus* (*Glyptotendipes*) *paripes* Edwards, male dorsal appendage of hypopygium.
78. *Chironomus* (*Chironomus*) *trinigrivittatus* sp. nov., male dorsal appendage of hypopygium.
79. *Chironomus* (*Chironomus*) *dystenus* Kieffer, male dorsal appendage of hypopygium.
80. *Chironomus* (*Chironomus*) *circumdatus* Kieffer, male dorsal appendage of hypopygium.
81. *Chironomus* (*Chironomus*) *nipponensis* sp. nov., male dorsal appendage of hypopygium.
82. *Chironomus* (*Cryptochironomus*) *sauteri* Kieffer, male dorsal appendage of hypopygium.
83. *Tanytarsus* (*Tanytarsus*) *formosanus* Kieffer, male dorsal appendage of hypopygium.
84. *Tanytarsus* (*Micropsectra*) *shinanoensis* sp. nov., male dorsal appendage of hypopygium.
85. *Tanytarsus* (*Cladotanytarsus*) *van-der-wulpi* Edwards, male anal point and dorsal appendage of hypopygium.
86. *Tanytarsus* (*Tanytarsus*) *thermæ* sp. nov., male dorsal appendage of hypopygium.
87. *Culicoides unguis* sp. nov., female wing.
88. *Dicrobezzia sugiyamai* sp. nov., female wing.
89. *Stilobezzia albicornis* Kieffer, female wing.
90. *Stilobezzia notata* de Meijere, female wing.
91. *Stilobezzia monticola* sp. nov., female wing.
92. *Stilobezzia notata* de Meijere, male hypopygium.
93. *Stilobezzia monticola* sp. nov., male hypopygium.
94. *Ceratopogon* (*Trishelea*) *incompleta* Kieffer, male style.
95. *Atrichopogon* (*Atrichopogon*) *ezoensis* sp. nov., male style.

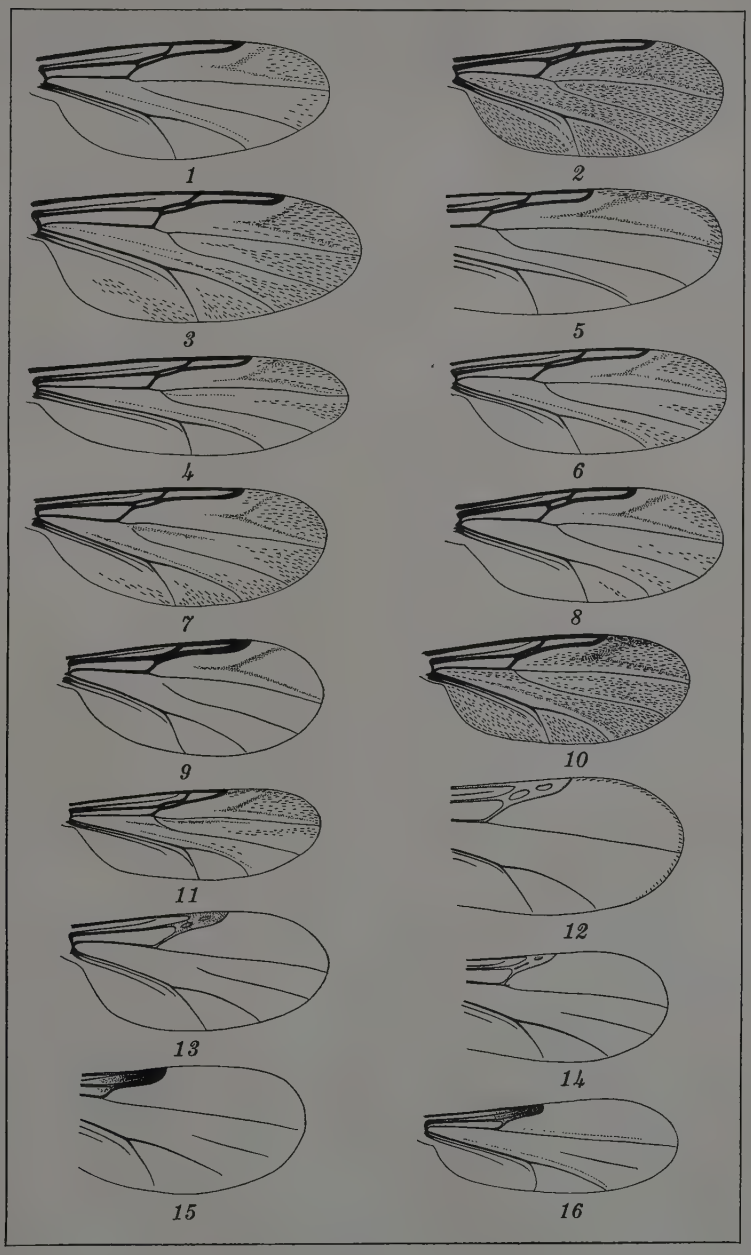

PLATE 1.

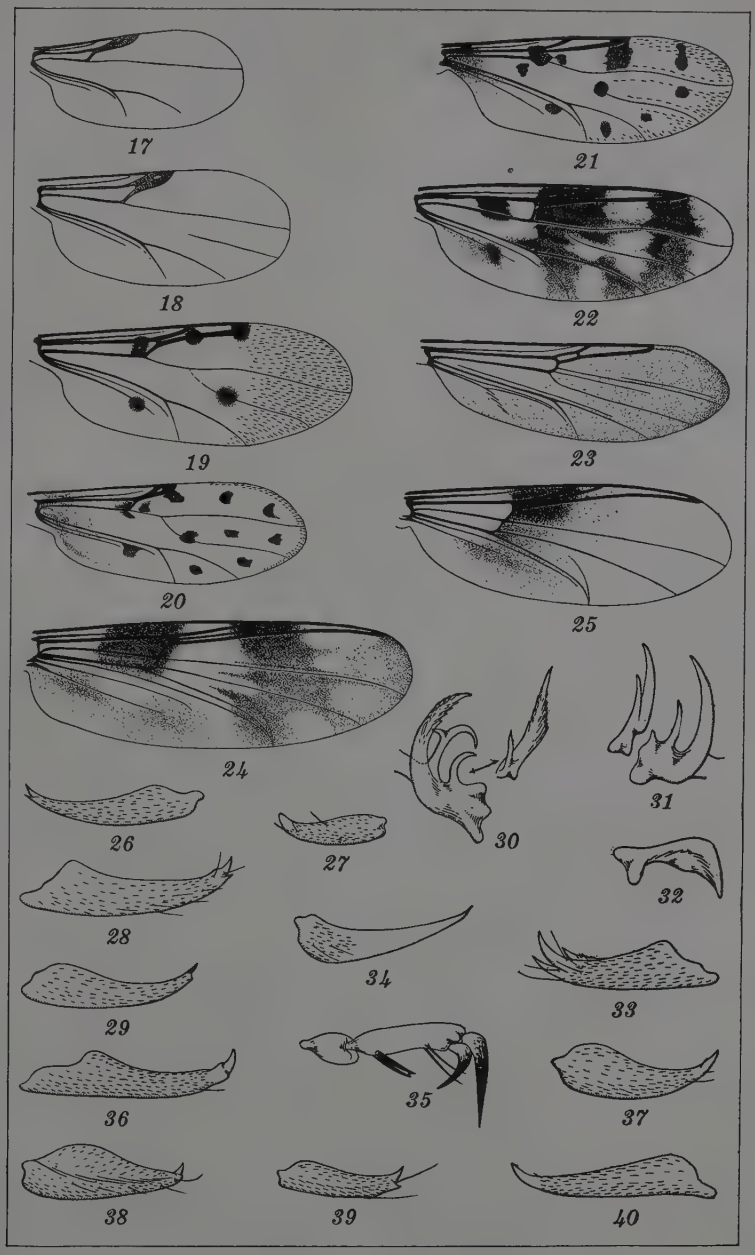

PLATE 2.

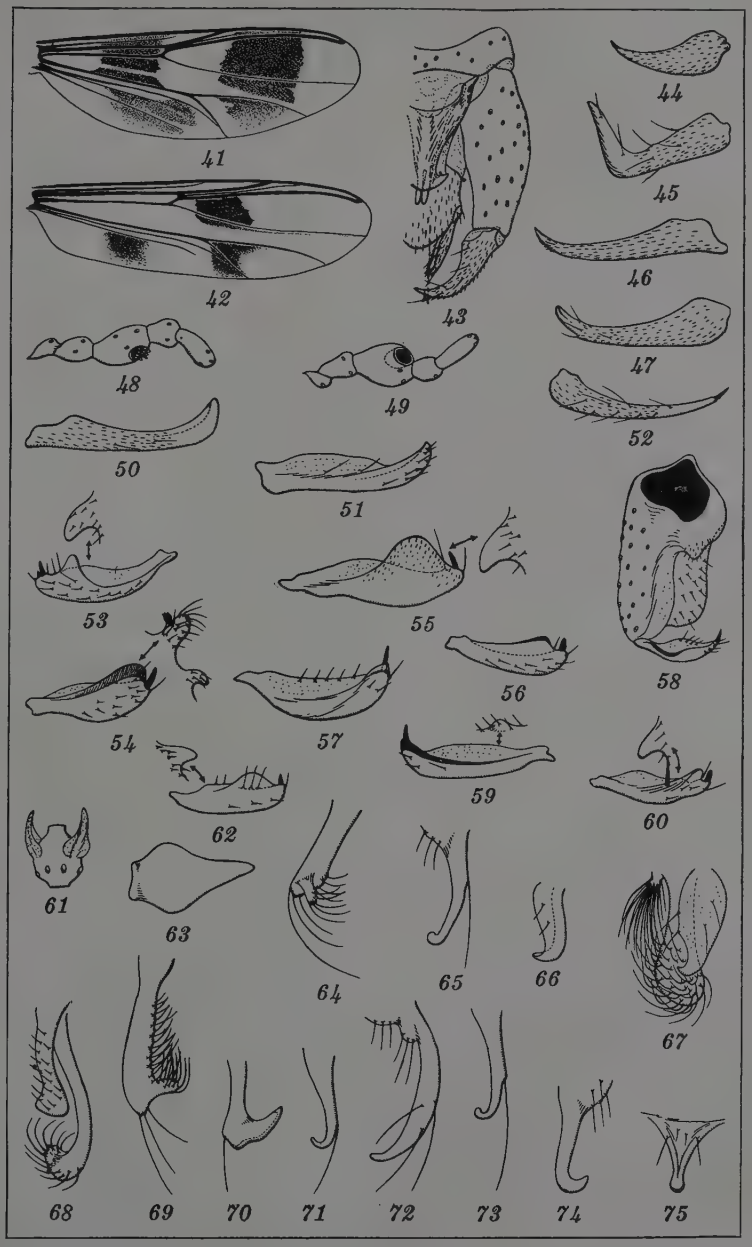
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PLATE 3.

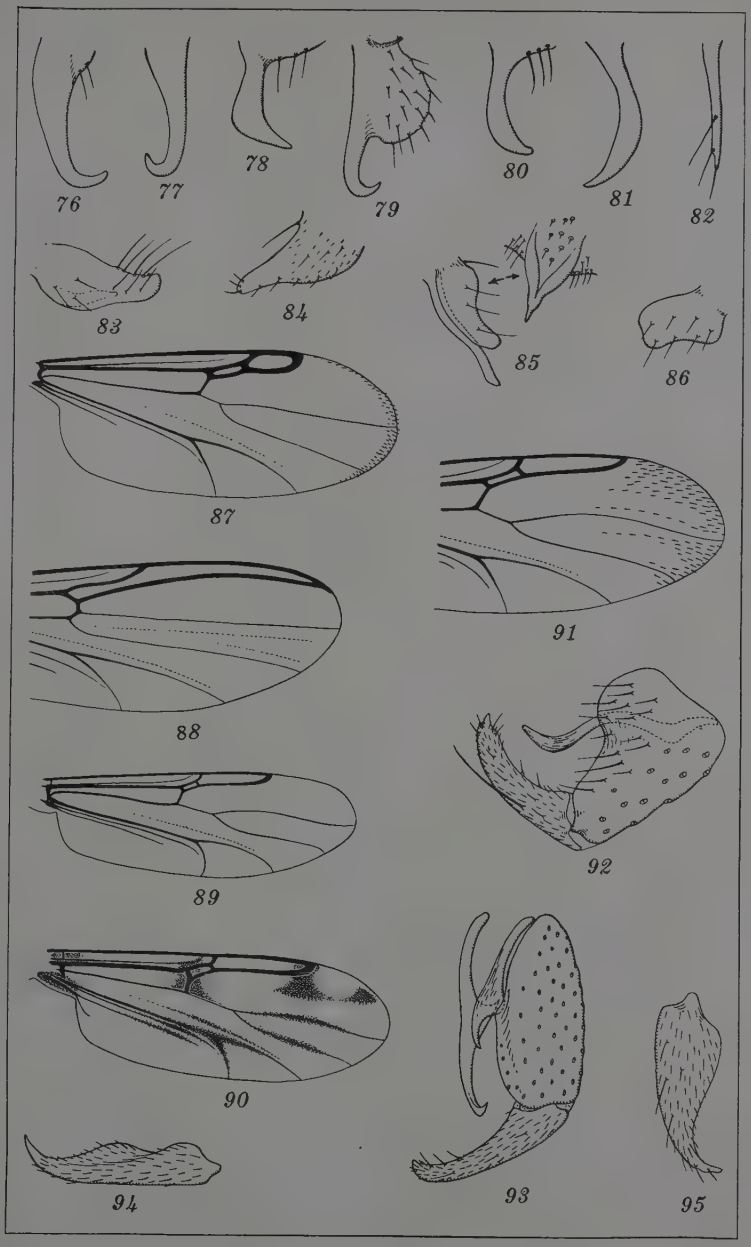

PLATE 4.

PHILIPPINE CORYPHÆNIDÆ

By ANTOLIN G. AGCO
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ONE PLATE

This paper deals with the systematic description of *Coryphæna hippurus* Linnæus, of the family Coryphænidæ, not previously reported from the Philippines. The description is based on a single specimen collected by the writer from Naujan, Mindoro, May 19, 1939, and at present kept in the ichthyological collection, Division of Fisheries, Department of Agriculture and Commerce, Manlia.

The family includes the "dolphins," or "dorados," fast-swimming pelagic fishes abounding in the open sea, and considered excellent food fishes, usually caught by trolling.

CORYPHÆNIDÆ

Body oblong or elevated, compressed, with small, firm, cycloid scales. Lateral line irregularly curved above pectoral, becoming straight behind it up to caudal. Mouth wide. Opercular apparatus entire. Branchiostegals five to seven. Gill membranes free from isthmus. Pseudobranchiæ and air bladder absent. Dorsal single, without distinct spinous portion. Anal similar to dorsal but very much shorter. Dorsal and anal without true spines. Pectorals falcate, short. Ventrals thoracic. Caudal deeply forked.

Large pelagic fishes living on the high seas of all temperate and tropical regions.

Genus CORYPHÆNA Linnæus

Coryphæna LINNÆUS, Syst. Nat. ed. 10 (1758) 261; CUVIER and VALENCIENNES, Hist. Nat. Poiss. 9 (1833) 203.
Lampugus CUVIER and VALENCIENNES, tom. cit. 235.

Body compressed, rather elongate; adult specimens with an elevated crest on skull; cleft of mouth oblique, chin slightly prominent. Dorsal single, extending from occiput nearly to caudal, which is deeply forked; no distinct dorsal and anal

spines; ventrals well developed, retractable partly into a groove on abdomen. Bands of recurved teeth in jaws, vomer, and palatines. Two patches of villiform teeth on tongue. Pyloric appendages exceedingly numerous.

CORYPHÆNA HIPPURUS Linnæus. Plate 1.

Coryphæna hippurus LINNÆUS, Syst. Nat. 10 (1758) 261; CUVIER and VALENCIENNES, Hist. Nat. Poiss. Paris 9 (1833) 206; GÜNTHER, Catalogue of Fishes in the British Museum 2 (1860) 405; Fische der Südsee II (1876) Journ. des Mus. Godeffroy 4 (1876–1881) 146; KLUNZINGER, Synopsis der Fische des Rothen Meeres. pt. 1 Percoiden—Mugiloiden. Verh. Zool. Bot. Ges. Wien 20 (1870) 446; LÜTKEN, Spolia Atlantica: contributions to the knowledge of the changes in forms in fishes, during their growth and development especially in the pelagic fishes of the Atlantic. Ann. & Mag. Nat. Hist. 7 (1881) 12; STEINDACHNER and DÖDERLEIN, Beiträge zur Kenntniss der Fische Japans. Denkschr. Akad. Wien 49 (1885) 171; DAY, Fishes of India 4° (1878–1888) 248; JENKINS, Report on the collection of fishes in the Hawaiian Islands, with description of new species. Bull. U. S. Fish Commission 22 [1902 (1904)] 447; JORDAN and EVERMANN, The aquatic resources of the Hawaiian Islands. Bull. U. S. Fish Commission 23 [1903 (1905)], 204; WEBER, Die Fische der Siboga Expeditie (1913) 409; MCCULLOCH, Check-list of the fish and fish-like animals of New South Wales. Aust. Zool. 1 (1919) 54; BARNARD, A monograph of the marine fishes of South Africa. II. Ann. South African Mus. 21 (1925–1927) 566; Fowler, Fishes of Oceania. Mem. B. P. Bishop Mus. 10 (1928) 137; WEBER and DE BEAUFORT, The Fishes of the Indo-Australian Archipelago 6 (1931) 185.

Coryphæna margravii CUVIER and VALENCIENNES, Histoire Naturelle des Poissons. Paris 9 (1833) 223.

Lampugus fasciolatus CUVIER and VALENCIENNES, Histoire Naturelle des Poissons. Paris 9 (1833) 243; BLEEKER, Ouer eenige Vischsoorten van den Kaap de Goode Hopp. Nat. Tijdschr. Ned. Ind. 21 (1860) 66.

Coryphæna japonica TEMMINCK and SCHLEGEL, Fauna Japonica. Poiss. (1842) 120.

Head 4; depth 4.4; dorsal 56; anal 24; pectoral 20, ventral 5.

Body elongate, compressed, tapering posteriorly. Head blunt, slightly convex. Mouth large, cleft oblique. Maxillary terminating below anterior margin of pupil. Jaws, palatines, and vomer with bands of recurved teeth; outer series on jaws larger, directed inward, set wide apart. Snout convex, about 3 in head. Eye 4.5 in head length. Interorbital greater than eye, with a slight rostronuchal crest. Opercular opening wide. Gill rakers 8, short and blunt. Dorsal originating above posterior border of eye, twelfth to sixteenth rays highest, gradually decreasing posteriorly. Anal of similar structure, but lower.

Pectorals falciform, short, 7 in standard body length. Ventrals inserted below anterior third of pectoral base, 1.4 in head. Caudal deeply forked.

Alcoholic specimen purplish black above, whitish below, with small black spots on sides, above and below lateral line.

The above description is based on a single specimen, No. 31954, 420 mm, collected from Naujan, Mindoro, May 19, 1939.

In the Philippines this species is quite rare and seldom, if at all, encountered in fish markets. It is known to inhabit the tropical and temperate seas of the Mediterranean, Atlantic, and Indo-Pacific.

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ILLUSTRATION

PLATE 1. *Coryphæna hippurus* Linnæus.

[The graphic scale represents 1 cm.]

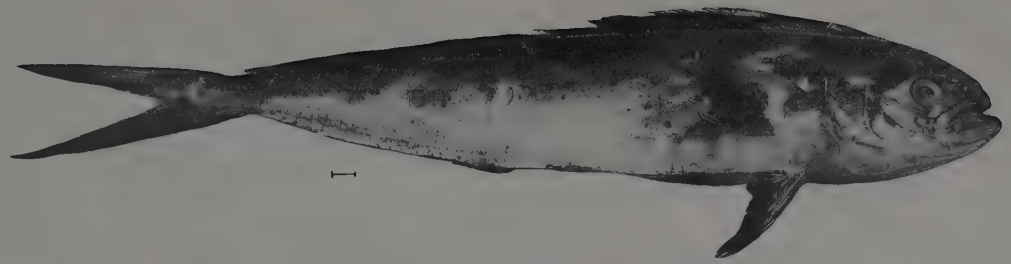

PLATE 1. CORYPHÆNA HIPPURUS LINNÆUS.

THE SALT-MAKING INDUSTRY OF NORTHWESTERN LUZON

By GUILLERMO L. ABLAN, JOSE R. MONTILLA, and BASILIO M. MARTIN

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THREE PLATES AND TWO TEXT FIGURES

This report presents the results of field studies made on the salt industries of Ilocos Norte, Ilocos Sur, La Union, and Pangasinan Provinces.

In Ilocos Norte Province the salt beds are located in Davila, Dilavo, and Santo Tomas of Pasuquin Municipality; in La Paz and Gabu of Laoag Municipality; in Masinloc, Callaguip, and Salindeg of Paoay Municipality; in Gaang of Currimao Municipality; and in Soucud and Pagsanaan of Badoc Municipality. In Ilocos Sur Province salt beds are situated in Dalaguitan, Bariquir, Cabangtalan, and Paratong of Sinait Municipality; in Bongro, Daklapan, Dardarat, and Solotsolot of Cabugao Municipality; in Pagsanaan and Miramar of Magsingal Municipality; in Pudoc of San Vicente Municipality; in Mindoro and San Pedro of Vigan Municipality; in Pasungol and Rancho of Santa Municipality; in Paratong and San Pedro of Narvacan Municipality; in Nalvo and Lingsat of San Esteban Municipality; in Apatot, Ambucao, and Sabañgan of Santiago Municipality; in Nagalisan and Baling of Santa Lucia Municipality; and in Bay and Baygao of Santa Cruz Municipality. In La Union Province salt beds are present in Mindoro, Alzate, and Busilac of Bangar Municipality; in Nalvo, Paraoir, and Darigayos of Luna Municipality; in Madayegdeg, Pagdar-aoan, and Pagdalagan of San Fernando Municipality; in Baybay, Rawis, and Namonitan of Santo Tomas Municipality; in Payocpuc Norte, Payocpuc Sur, and Parian of Bauang Municipality; in Ariñgay Point of Ariñgay Municipality; and in Baroro of San Juan Municipality. In Pangasinan Province salt beds are located in Tambobong, Amalbalan, Malacapas, Ulii Egui, Hermosa, and Macaleng of Dasol Municipality; in Carot, Tondol, Sabling, Macalieng, Dalaoan, Cabungan, Awili, Nara, Siapar, Toritori, and Maluong of Anda

Municipality; in Bateng, Bantayan, Talogtog, Maasin, and Anulid of Mangaldan Municipality; in Tambac, Bonuan, Salapiñgao, Carael, and Sabañgan of Dagupan Municipality; in Baybay, Baquioen, Salumagui, and Aroro of Sual Municipality; in Telbang, Lucap, and Hundred Islands of Alaminos Municipality; in Na-

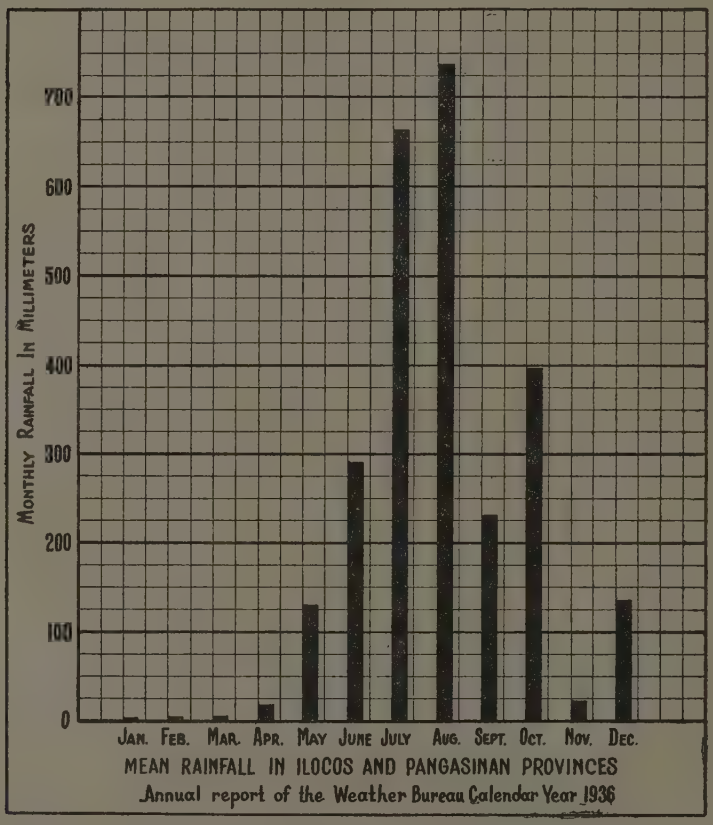

Fig. 1. Mean rainfall in Ilocos and Pangasinan Provinces.

yon, Cato, Bayambang, and Banog of Infanta Municipality; in Binabalian, Pilar, Dewey, and Zaragosa of Bolinao Municipality; in Loñgos, Cayañga, and Mabilao of San Fabian Municipality; and in Libsong Maniboc of Lingayen Municipality.

Due to its topography and climatic conditions, this region has two distinct seasons, wet and dry. The Cordillera Mountains run from North to South and are traversed by the Caraballo Mountains. The wet season occurs during the typhoon season, May to October. Text figs. 1 and 2 are charts of the monthly rainfall in Laoag, Ilocos Norte Province; Vigan, Ilocos Sur Province; San Fernando, La Union Province; and Dagupan, Pangasinan Province. During the typhoon season these mountain ranges cause the winds from China Sea to deposit their mois-

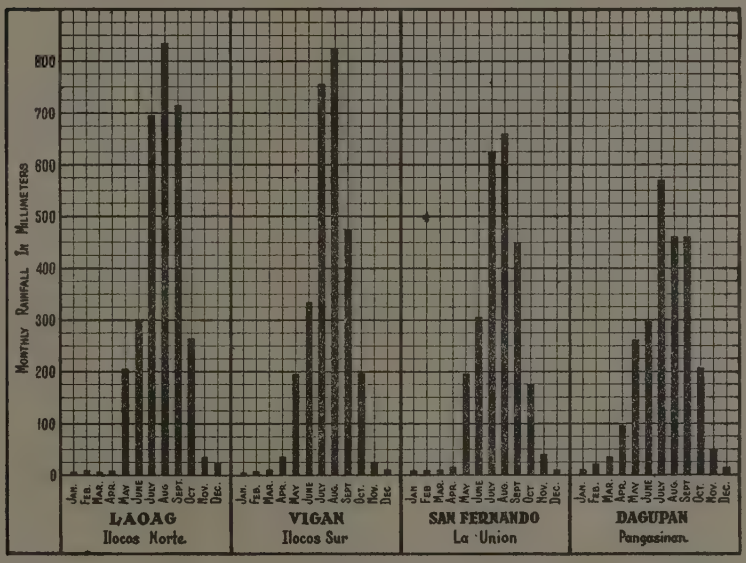

Fig. 2. Types of monthly rainfall in Laoag, Ilocos Norte; Vigan, Ilocos Sur; San Fernando, La Union; and Dagupan, Pangasinan.

ture in large quantities on the plain; but they protect the plains completely from the northeast monsoons, which therefore bring no rain to this region. Moreover, in this region precipitation from the thunderstorms of March and April is deposited in the mountains and not on the plains. The six months after the wet season constitute the dry season, during which wet farming is not profitable, and the people take up other occupations such as salt making and dry farming. The season of salt making lasts from January to June.

The annual consumption of salt in the Philippines is 67,000,000 kilograms, valued at about 1,049,000 pesos.[1] The principal salt consumers are the manufacturers of bagoong,[2] local fish driers and salters, and laundry-soap makers. The demand for salt will undoubtedly increase as the Philippines ventures farther into industrial development, especially in the fishing industries.

In addition, salt is used for (*a*) food, (*b*) toyo making (soybean sauce), (*c*) fertilizers, (*d*) curing of hides and skins, (*e*) as a source of brine in making ice cream, in refrigeration, and in ice factories.

MATERIALS FOR SALT MAKING

Tables 1 and 2 are itemized lists of the equipment and capital needed for salt manufacture by the local method:

TABLE 1.—*Equipment used in salt making by the local method and cost.*

Local name.	English term.	Cost. Pesos.
Alolong or calapao	Shed	5.00
Babaco or laga	Bamboo basket	.60
Barilis	Wooden keg	.60
Bocsot or laga	Bamboo basket	2.00
Cajon	Wooden box	.50
Dakoan	Leaching vat	4.00
Goyuran	Yoke and rope	.60
Isec (calaticat)	Bamboo reinforcement	.30
Ragadi	Saw	1.00
Nipa tapi	Apron of vat	.80
Pasig or malabi	Earthenware	4.50
Pilon	Earthen jars	.70
Sagar	Harrow	.70
Siliasi	Kettle	6.50
Sursur	Iron lath	.10
Timba	Pail	.20
Tongtong or caraan	Furnace or oven	1.00
Oasay	Axe	1.50
Upa ti daga	Land rental	6.50
	Total	37.10

[1] Notes on Salt Manufacture. Agricultural and Industrial Monthly (October, 1937). One peso equals 50 cents United States currency.

[2] Fermented fish product.

TABLE 2.—*Daily operating expenses in salt making.*

Item.	Pesos.
Fuel	.60
Kerosene	.10
Labor	2.40
Depreciation	.20

A shed, *alolong* (Pang.), Plate 3, fig. 1, serves as temporary shelter for salt makers and at the same time as a storehouse to accommodate the necessary materials. It is made of local light materials, such as nipa or cogon grass, for roofing and walling, and of bamboo posts.

There are three types of leaching vats commonly used in the preparation of the brine. One of these, the *colongcong* (Ilk.), made of wood, resembles a banca in shape. It is 10 feet long, 2 feet deep, and 2 feet wide. (Plate 3, fig. 2.) The *dakoan* (Pang.) is a trapezoidal receptacle, more than 2 meters long, more than 1 meter deep, and 1 meter wide (Plate 3, fig. 3). The other type is a large bamboo basket, *bakar* (Ilk.), with a diameter of 3.5 feet and up to 2 feet high (Plate 2, figs. 1 and 2).

The *tongtong,* Plate 2, fig. 3, or earthen oven, *pugon* (Pang.), is fashioned of pounded soil, reinforced with woven bamboo to strengthen the foundation and to make the oven more substantial. On the oven are two openings, one on top into which the kettle is fitted and the other in front through which fuel is inserted. Construction generally requires about two days, and hardening takes about two days more. It is the general contention among the local salt makers that a faultily constructed oven consumes much fuel.

The *siliasi* is either a kettle in the shape of a deep-bellied circular bowl or a rectangular container, with an average capacity of 3 to 5-gallon cans of brine. The number of boilings made in a day depends on the type of kettle and on the efficiency of the oven.

The containers to accommodate the brine leached from the soil are kegs; such as *pilon,* a wide-mouthed earthen jar; *pasig,* a narrow-necked earthen vessel; *timba,* a locally-made pail; and *barilis,* a deep wooden keg.

The tools used for the preparation of the fuel are the *ragadi* (saw) and the *oasay* (axe) with which fuel is split for the oven.

The tools, Plate 1, fig. 1, used for loosening earth are the the *sagar,* a wooden, harrow-shaped implement equipped with a series of nails; a *goyuran* unit, a set of ropes and yokes with

which the sagar is pulled by a work animal, usually a carabao; bamboo rigs, like bamboo pushers; and empty coconut shells to scrape up the surface soil.

The implements required in evaporating the brine are the *gumba,* of circularly woven bamboo *sawali,* furnished with a handle to counteract overflow; *caus ti luag,* a foam scraper to remove impurities; *sursur,* an iron lathe for turning over crystallizing salt to prevent overcooking; and a coconut-shell laddle with which the salt is dipped out from the kettle into a home-made basket for draining the salt off the "bittern."

METHOD

The manufacture of table salt commonly consists in the evaporation of brine solution over artificial heat. The process is always the same with only slight variation in the choice and use of implements. In Batangas, Bulacan, Cavite, and Rizal Provinces the brine is evaporated by solar heat.

Fishponds and other coastal areas influenced by tidal water and in a dry state are usually utilized. Most of the beds have clay soil, and only a few have fine sandy loam. The clay soil is losened with the sagar and goyuran units often pulled by an animal, and the loosened earth is raked by a bamboo pusher to form a series of mounts. These mounts are carried either in bull carts or in baskets and piled near the leaching vat. With sandy loam coconut shells or split bamboos are used to scrape up the surface soil.

The filtering vat filled with salt-encrusted soil from the pile is leached with brackish water from a nearby well. The leaching is discontinued when all the salt is extracted; otherwise the filtered brine is not concentrated enough for evaporation.

The specific gravity or salinity of the brine is determined in four ways. One way is to throw into the brine *arinaya* (Ilk.), small branches of shrubs usually found growing along the shores. If the arinaya floats, the brine is considered concentrated enough for evaporation. If it sinks leaching is continued. Another way is to float *toñgaltao* (Ilk.), a native resin prepared in small pebblelike particles. If this pebble-like resin floats, the solution is ready for evaporation, otherwise the brine is further concentrated through leaching. Another method to ascertain the concentration of the brine solution is the least accurate of all the native methods used. The fingers are inserted through the leached mud from the fish pond. Leaching is continued until the fingers can no longer feel the

roughness which is characteristic of salt particles. Still another method is the use of a small bottle containing a few stone weights. This bottle is tightly corked and is tied to a string by which it is held during the test.

The concentration may also be ascertained by a gravity spindle or salometer, a hydrometer which is specially graduated for salt solutions. A vat with a capacity of approximately 57 5-gallon cans of earth leached with 34 5-gallon cans of brackish water gives a brine content of 16 5-gallon cans for cooking. The preparation of the brine takes approximately 8 hours. In this leaching operation there is great variation of salometric readings for every filling of a pilon containing 4.33 5-gallon cans. Table 3 shows the variation.

TABLE 3.—*Variation of the concentration of brine.*

Sample.	Number of 5-gallon cans of brine.	Salinity reading.
1	4.33	95
2	4.33	92
3	4.33	83
4	3.00	64
Total 16	Average	83.5

March 9, 1938, the brine ready for boiling in barrio Tambac, Dagupan, Pangasinan Province, was measured by a salinometer, and gave the following concentrations:

Sample.	Concentration.
1	100.0
2	97.0
3	98.0
4	96.0
5	89.5
6	99.0

The peak of salt making in this part of Luzon is March, when concentration readings are high. Approximately 8 hours of boiling or evaporation are needed to crystallize the salt from the brine. During this process a gradual generation of heat is necessary, with constant turning over of the salt in order to prevent it from burning and overcooking. The impurities which show on the surface as foam during boiling are scooped off. When the pickle diminishes in volume by more than 5 gallons, the general practice of some salt producers is to replace the same

volume by adding fresh brine with the sole purpose of getting more salt. In other localities no replacement of what is evaporated is made and the brine is simply boiled until the salt crystallizes out. When boiling has reached a point when all salt has settled, the salt is placed into a bamboo basket to dry over night before it is stored in wooden boxes. For the next cooking the kettle is refilled and the same process is repeated. Generally a well-constructed oven has an output of 1½ cavans of salt in 24 hours.

CHEMICAL ANALYSIS

Table 4 shows the result of chemical analysis of four samples of salt submitted by the Fish and Game Administration [3] to the Tests and Standards Division, Bureau of Science.

TABLE 4.—*Chemical analyses of four samples of salt from the four localities studied.*

Chemical compound.	Ilocos Norte.	La Union.	Ilocos Sur.	Pangasinan.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
$CaSO_4$	0.880	0.310	0.820	1.16
$MgSO_4$	1.070	1.500	1.010	1.64
$MgCl_2$	0.360	0.620	1.350	0.43
Kcl	11.390	9.950	9.740	3.40
NaCl	85.840	80.590	76.720	85.00
SiO_2	0.040	0.130	0.100	0.34
Fe_2O_3	0.004	0.006	0.008	0.02
Al_2O_3	0.036	0.274	0.492	0.46
Moisture at 105°C	0.830	6.830	9.770	7.38

Table 4 shows that considerable moisture is present in the salt samples from La Union, Ilocos Sur, and Pangasinan Provinces, due to the presence of impurities, like magnesium and calcium salts, which have a great affinity for moisture. Magnesium also imparts a markedly bitter taste to the salt (Tressler 1923).

THE SALT TRADE OF PANGASINAN AND THE ILOCOS PROVINCES

The salt produced in the coastal regions of Pangasinan, La Union, Ilocos Sur, and Ilocos Norte Provinces is an article of local trade. A small amount is bartered for fuel, rice, root crops, and other products, but the bulk of the salt produced in

[3] Now the Division of Fisheries, Department of Agriculture and Commerce.

Pangasinan and Ilocos Sur Provinces is sold for cash to fish-preservation plants. The salt trade is active during the peak of the season, when the price of salt is rather low. People with ready cash buy salt at low prices and store it until the rainy season when the price goes up. Owners of some bagoong plants usually send out an agent to buy salt at a low price. In Pangasinan Province the municipalities of Anda, Dasol, and Infanta, produce salt in excess of the local demand. The salt is shipped in sail boats, which make regular calls during the season at these points, to the bagoong plants in San Fabian, Damortis, Aparri, and Cagayan. The cost of transporting a cavan of salt from any of the above salt beds to these points is 20 centavos, more or less, depending upon the distance.

Estimated annual production of salt.

Province.	Cavans.	Value. Pesos.
Ilocos Norte	15,000	12,528
Ilocos Sur	39,000	31,731
La Union	8,911	7,128
Pangasinan	135,000	108,000
Total		158,387

The salt industry of these provinces is estimated to have an annual output valued at around 158,387 pesos.

SUMMARY AND RECOMMENDATIONS

The estimated cost of production of a cavan of salt by cooking is approximately 3 pesos. Its sale value at the local plants (during the peak of production, March and April) is only about 80 centavos. Thus, the local producers are getting only about 35 per cent of the cost of production. On the other hand, the middlemen who buy the salt at 80 centavos are able to sell at the rate of 1.80 pesos to 2.50 pesos per cavan, making a gross profit from 110 to 210 per cent. On this basis, even if the local producers wait for the highest price to sell their salt, the price is still below the production cost, and the production of salt locally with the use of artificial heat is an unprofitable venture. The salt produced is of fine grain and has a sodium chloride content of 85 per cent. The output per oven is $1\frac{1}{2}$ cavans in 24 hours.

In the production of salt by the solar method, locally introduced as the "Cavite process", where sun energy is employed, fishponds, lower areas, or tidal lands along the coast line are prepared for salt making. Fuel cost is totally eliminated. The

expense involved in the construction of the plant, however, should not be overlooked.

Cox and Dar Juan (1915) estimate that the production per laborer by the solar method is about 200 kilograms or 4 cavans of salt per day, salable at 50 centavos a cavan. The deduction of 1.20 pesos for labor and equipment leaves a gross income of 80 centavos per day. It is seen that the gross margin of profit by the solar method is a little more than the expense for fuel in 24 hours by the boiling method.

Herre and Mendoza estimate that solar salt that may be produced from more than one half hectare of land is 600 to 800 *ticlis* or cavans, with a value of from 300 to 400 pesos.

The manufacture of salt by the solar method carries, therefore, several advantages over that by the boiling method. In view of these advantages it may be worthwhile to introduce in northern Luzon the manufacture of salt by the solar method.

Local producers employing the cooking method, upon realizing the advantage of the new method, may abandon the old and unprofitable one. There are several localities, mostly in Pangasinan Province, where salt beds may be advantageously constructed; for example, in Anda, Dasol, and Infanta. These are at present producing large quantities of salt by the boiling method. They are accessible by sailboat, which is a good means of shipping the product to the markets.

The present product is below the standard of purity in comparison with foreign salt; naturally, the product for the preservation of which it is employed is of inferior quality.

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ILLUSTRATIONS

PLATE 1

FIG. 1. Loosening surface soil by means of the *sagar*.
2. Mounts of surface soil.
3. Conveying brine into the cooking shed.

PLATE 2

FIG. 1. Type of leaching vat made of baskets.
2. Another type of leaching vat used in making salt.
3. Earthen oven (*pugon*).

PLATE 3

FIG. 1. Temporary shed (*alolong*, Pang.).
2. Leaching vat (*colongcong*, Ilk.).
3. A typical leaching vat (*dakoan*, Pang.).

TEXT FIGURES

FIG. 1. Mean rainfall in the Ilocos and Pangasinan Provinces.
2. Types of monthly rainfall of Laoag, Ilocos Norte; Vigan, Ilocos Sur; San Fernando, La Union; and Dagupan, Pangasinan.

PLATE 1.

PLATE 2.

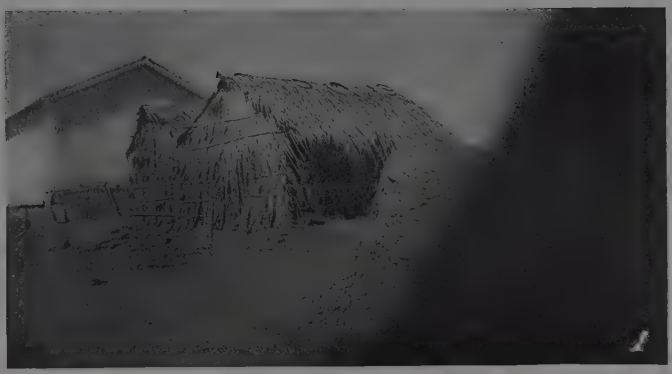

PLATE 3.

THE VALIDITY OF ARTOCARPUS CAMANSI BLANCO

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TWO PLATES

In the course of the preparation of illustrations for a proposed Flora of the Philippines, and particularly while preparing the drawings of "rimas" and "camansi," based on fresh specimens, the author has noted striking differences between these two previously much confused Philippine species of *Artocarpus*. While in appearance *Artocarpus camansi* is very similar to the form described by Blanco as *Artocarpus rima*, it differs in always producing fruits with numerous seeds, while *Artocarpus rima* Blanco (=*A. communis* Forst.) is always seedless. There are also striking differences in the anthocarps; in "rimas" these are flat and rounded, while in "camansi" they are narrowly conical, prolonged, and very conspicuous. Other important features are shown in Table 1. *A. camansi* Blanco should not be confused with the seeded *A. Blancoi* (Elmer) Merr., known here as "Antipolo," which is very distinct. "Antipolo" has slender and greatly prolonged anthocarps.

TABLE 1.—*Comparison of Artocarpus camansi and Artocarpus communis.*

Species.	Fruit.	Anthocarps.	Base of fruit.	Male inflorescence.	Stigmas.	Leaves.
Artocarpus camansi.	Seeded	Narrowly conical, prolonged.	Rounded	Club-shaped	Elongated.	Usually four or five divisions on both sides.
Artocarpus communis.	Seedless	Flat or rounded, slightly projecting.	Oblique	Narrowly oblong-obovoid, thickened at middle.	Very short.	Usually three divisions on both sides.

While Blanco's type specimen is not extant (for he apparently preserved no botanical specimens), his species is so well known here and is so constantly recognized by Filipinos as "camansi" that no difficulty exists in interpreting the species.

ARTOCARPUS CAMANSI Blanco. Plate 1.

Artocarpus camansi BLANCO, Fl. Filip. (1837) 670 (*Arcthocarpus*); ibid. ed. 2 (1845) 467 (*Artocarpus*); ibid. ed. 3 3 (1879) 77, *t. 457;* F.-VILL. Novis. App. (1880) 202; MERRILL, Sp. Blancoanae (1918) 124; Enum. Philip. Fl. Pl. 2 (1923) 40.

Blanco's original description is as follows:

Artocarpus Camansi.[1] *Artocarpo camansi. Hojas* anchas medio lanceoladas, algo asperas en ambas paginas, y con pelillos en las venas, con diez ú mas lobulos lanceolados que miran acia arriba *Machos* en espata monofila hendida en dos partes, que encierra un receptaculo comun largo, de figura de maza, cubierto de estambres. *Filam* casi nulos. *Ant.* de dos aposentos.

Hembras en un receptaculo comun oval ó globoso, crizado de puntas conicas, que cubren á los germenes; cada uno de estos con un estilo y dos estigmas revueltos á los lados. *Cal. y Cor. propios* ningunos. *Fruto* compuesto de infinitas semillas, como en la *Nangca,* rodeadas cada una de una piel membranacea.—Este arbol que no deja de ser conocido, es tan grande como el Antipolo. El fruto se hace mayor que la cabeza de un hombre: esta rodeado de aposentos, y en cada uno hai una semilla oval. Sus hojas son de dos pies de largo. Las semillas que son grandes como bellotas, se comen crudas ó cocidas, y tienen un sabor agradable parecido al de las castañas, y asi las llaman algunos: de las flores machos se hace dulce. Es indigeno de las Islas. *Flor en Mayo. B, T, Dalangian, Dolongyian, Camangsi. Y, Pacac.*

Fernandez-Villar described *A. camansi* as follows:

Artocarpus camansi.[2] FOLIA lata sublanceolata, utraque pagina scabra, in venis pilosiuscula, 10-pluri-loba, lobis lanceolatis et sursúm spectantibus. Masculorum spatha monophylla, bifida, receptaculum commune longum, clavatum, staminibus opertum, claudens. Filam. subnulla. anth. biloculares. Foemineorum receptac. commune ovale aut globosum, muricibus conicis, ovariaque tegentibus, vestitum. Ovar. 1-stylifera. Stigm. 2, lateralitér revoluta. Cal. et cor. proprii o. Fructus polyspermus. Semina membrana vestita, etc. ut in *A. integrifolia.* Videtur varietas. *A. incisae.*

T. V. *Dalañgian.—Doloñgian.—Camangsi.—*

I. Pacac, Vid. Append. Gener.: ARTOCARPACEÆ.

Arbor indigena, 60-pluri-pedalis, nota. Fructus humano capite major, edulis.—Flor. mens. Maj.

Large trees with spreading crown, 10 to 15 m high, of the habit of *A. communis* (rimas). Leaves very large, ovate to oblong-ovate, coriaceous, 40 to 60 cm long, 25 to 45 cm wide, parenchyma bright dark green, nerves yellowish green, sparingly pubescent on both surfaces above, very pubescent on nerves

[1] Blanco, Flora de Filipinas (1837) 670.

[2] F.-Villar in Blanco, Flora de Filipinas ed. 3 3 (1879) 77.

beneath, accuminated, deeply pinnate, 4- to 5-lobed, lobes ovate, acute; petioles stout, very pubescent, 5 cm long or less; stipules large, deciduous, brown, pubescent, 10 to 12 cm long. Male spike club-shaped, curved at base, cylindric, greenish yellow, 15 to 25 cm long, 3 to 4 cm in diameter; peduncles 4 to 5 cm long, very pubescent. Anthers 2 to 2.5 mm long. Filaments 0.70 to 0.75 mm long. Female inflorescence ovoid or subglobose; peduncles pubescent. Style exerted; stigma 2-lobed, elongated; very prominent; fruit ovoid or subglobose, green, 10 to 15 cm long, 7 to 12 cm in diameter; peduncles pubescent, 5 to 6 cm long; tips of anthocarps narrowly conical, prolonged, 5 to 8 mm long, 5 mm thick or less at base. Seeds rather numerous, ovoid to subglobose, about 2.5 cm in diameter.

LUZON, cultivated in Manila, February, 1915, here known as *camansi* (*Merrill:* Species Blancoanae *No. 830*), Merrill, *s. n.* August, 1911; cultivated at Botanical Garden, *For. Bur 19014 H. M. Curran,* May 16, 1909: Cagayan Province, Tuguegarao, *For. Bur. 18529 R. I. Alvarez,* April 15, 1909. LEYTE, Ormoc, *For. Bur. 11573 H. N. Whitford,* March 13, 1909. CEBU, Bucacao, *Bur. Sci. 11069 M. Ramos,* March 12, 1912.

ARTOCARPUS COMMUNIS Forst. Plate 2.

Artocarpus communis FORST., Char. Gen. (1776) 102, *t. 50–51a;* MERRILL, Philip. Journ. Sci. 1 (1906) Suppl. 43; ibid. § C 3 (1908) 401; Fl. Manila (1912) 176; Sp. Blancoanae (1918) 123, 124; Enum. Philip. Fl. Pl. 2 (1923) 40; ELMER, Leafl. Philip. Bot. 2 (1909) 615.

Radermachia incisa THUNB., Vet. Akad. Handl. Stockh. (1776) 254.

Artocarpus incisa LINNÆUS, f., Suppl. (1871) 411; F.-VILL., Novis. App. (1880) 202; VIDAL, Sinopsis Atlas (1883) 40, *t. 88, f. B.;* Rev. Pl. Vasc. Filip. (1886) 254; MERRILL, Philip. Bureau Forest. Bull. 1 (1903) 17.

Artocarpus rima BLANCO, Fl. Filip. (1837) 671 (*Arcthocarpus*); ibid. ed. 2 (1845) 467 (*Artocarpus*); ibid. ed. 3 3 (1879) 77, *t. 267.*

Rima SONN, Voy. Nouv. Guin. (1876) 99, *t. 57–60.*

Saccus communis O. K., Rev. (1891) 633.

It is noted that *Artocarpus communis* Forst. and *Radermachia incisa* Thunb. were published in the same year, and that it may not be possible to determine which specific name was first published. Under the circumstances Forster's binomial is retained, first because it supplies the oldest specific name under *Artocarpus,* and second because Forster's description is illustrated by two good plates. If it could be proved that *Radermachia incisa* Thunb. was actually published before Forster's work appeared, *A. incisa* (Thunb.) Linn. f. would be the ac-

cepted name. Attention is called to the fact that there is a generic name older than either *Artocarpus* or *Radermachia*, in *Sitodium;* [3] in botanical literature the actual publication of *Sitodium* has been hitherto credited to Gaertner.[4] *Artocarpus* Forst. is the name recommended for conservation; *see* Fosberg, loc. cit.

The breadfruit was originally described from specimens apparently taken from planted trees in Polynesia, where the species seems manifestly to be an introduced one. In Polynesia a very large number of varieties are recognized by the local residents, but the variations represent horticultural rather than botanical values, and it scarcely seems to be desirable to even propose varietal (trinomial) names for these numerous forms of what is, after all, a cultigen. We do not know that the wild form of the breadfruit (*Artocarpus communis* Forst.) is known, but it may reasonably be assumed to be derived, by selection, from some species perhaps even approximating the "'camansi," which, however, seems manifestly to be specifically distinct from *A. communis* Forst. as that species is currently interpreted.

[3] Parkinson, Journ. Voy. Endeavour 45 (1773) (*see* Fosberg, Am. Journ. Bot. 27 (1939) 231.

[4] Fruct. 1 (1788) t. *71, 72.*

ILLUSTRATIONS

PLATE 1

Artocarpus camansi Blanco. Fig. *1*, habit, very much reduced; *2*, male spike, reduced; *3*, transverse section of male spike, showing details of stamens, very much enlarged; *4*, view from above of a portion of male spike, showing anthers and perianth, very much enlarged; *5*, a young female inflorescence, much reduced; *6*, transverse section of a young female inflorescence, showing anthocarps with prolonged, narrowly, conical tips, and bilobed stigmas, very much enlarged; *7*, fruit in section, reduced; *8*, seed with core and wall intact, slightly reduced; *9* and *10*, seeds with the wall and core removed, slightly reduced.

PLATE 2

Artocarpus communis Forst. Fig. *1*, habit, very much reduced; *2*, male spike, reduced; *3*, transverse section of male spike, showing stamens very much enlarged; *4*, view from above of a portion of male spike, showing anthers and perianth, very much enlarged; *5*, transverse section of a young female inflorescence, showing flat or rounded tips of anthocarps and inconspicuous stigmas, much enlarged; *6*, whole fruit, much reduced; *7*, a fruit in section, much reduced.

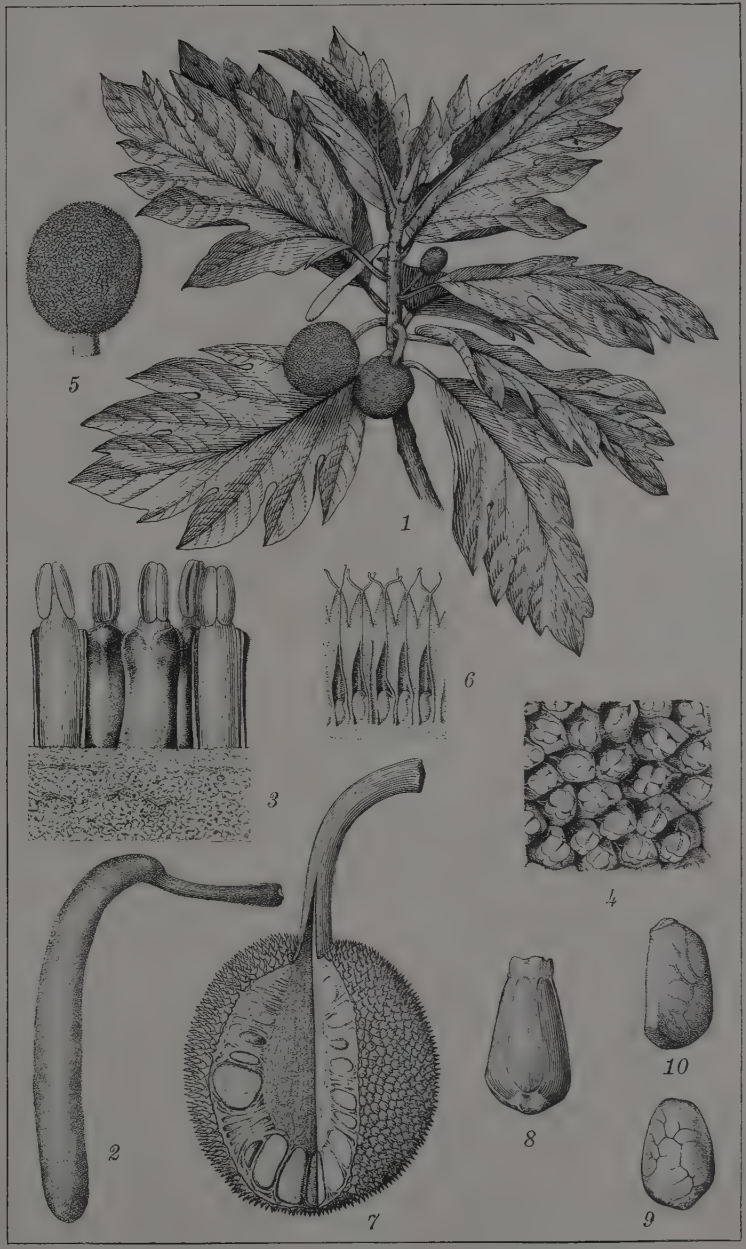

PLATE 1. ARTOCARPUS CAMANSI BLANCO.

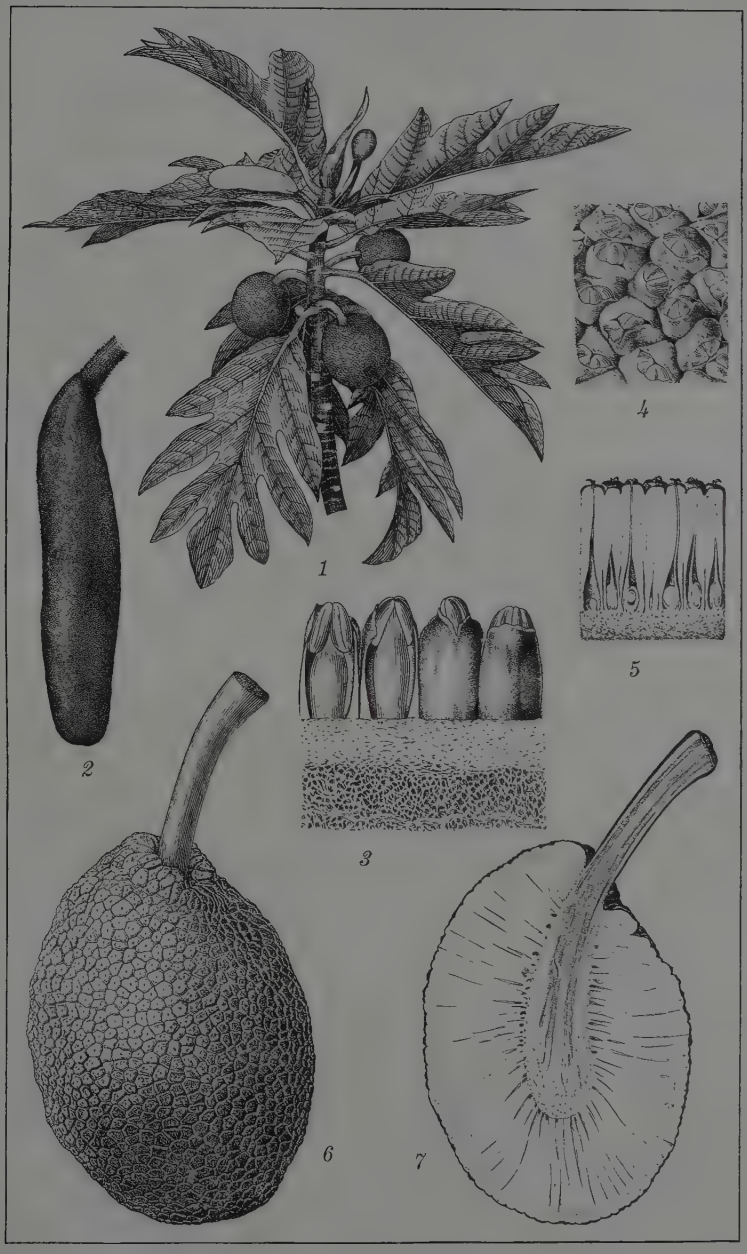

PLATE 2. ARTOCARPUS COMMUNIS FORST.

A REVISION OF THE GENUS PSALLIOTA IN THE PHILIPPINES

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EIGHT PLATES

The nomenclatural confusion in the identification of some of the Philippine *Psalliota*, with its increasing number of species and their economic importance, all species being edible—makes it imperative that this genus be subjected to a thorough revision.

Agaricus argyrostictus Copeland in the Philippines is *Psalliota campestris* var. *radicata* Bresadola in Europe. Since the advent of the American regime in the Philippines many American species of this genus have been discovered here. *Psalliota arvensis*, commonly known as horse mushroom in the United States, and *Psalliota campestris* var. *umbrina* have been found near stables where army horses are kept. Current advertisements have been put up in many American magazines and papers on mushroom culture, and the enthusiasm for this occupation reached the Philippines. Spawns of *Psalliota campestris* have been ordered from abroad, and its culture tried in the Philippines. Unfortunately, due to the difficulty of maintaining a suitable temperature, and because of lack of proper knowledge regarding the culture of this mushroom, none of these projects has been successful. Local interest in the growing of mushrooms has therefore faded away gradually, but the introduction of *Psalliota campestris* into this country by this means cannot be denied. In Pasig, Rizal Province, large quantities have been collected very recently.

The genus *Agaricus* was founded [1] by Linnæus to include all agarics having spores of various colors; gills membranaceous, persistent, with an acute edge; trama floccose, putrifying and not reviving when once dried. Later Fries [2] changed the name *Agaricus* to *Psalliota* to include only agarics with purple, reddish

[1] Syst. Nat. (1736) 387. [2] Syst. Myc. 1 (1821) 280.

spores, more or less fleshy plants, and free gills. The stem is central, with a membranaceous ring. The interpretation of Fries is adopted in this paper.

Genus PSALLIOTA Fries

Psalliota FRIES, Hym. Eur. (1874) 278; PECK, N. Y. Mus. Rept. 36 (1894) 41; KAUFFMAN, Agar. Mich. 1 (1918) 232; REA, Brit. Basid. (1922) 82; BRESADOLA, Icon. Myc. 17 (1931) 45; MENDOZA, Philip. Journ. Sci. 65 (1938) 82.

Agaricus LINNÆUS, Syst. Nat. 5 (1735) 327; SACCARDO, Syll. Fung. 5 (1887) 993.

Pileus fleshy, convex, at length flattened, for the most part white to grayish yellow or dark, often scaly; gills crowded, free, white to rosy white, then tobacco-colored to dark purple; stipe fleshy, central, stuffed to hollow; annulus membranaceous, more or less persistent; volva absent; spores ellipsoid to ovoid, smooth, rose-colored to dark brown, dark purple.

All species are terrestrial, decaying, and edible.

Key to the Philippine species of Psalliota.

a^1. Small; pileus thin, normally less than 3 cm broad.
  b^1. Growing on open, grassy plains, sometimes forming fairy rings. 11. *P. perfuscus.*
  b^2. Growing under trees or banana groves, never forming fairy rings.
    c^1. Pileus with pinkish to reddish-brown hue, tinged with gray. 8. *P. diminutiva.*
    c^2. Pileus creamy-white, with reddish stains..... 7. *P. comtula.*
a^2. Large; pileus thick, normally more than 4 cm broad.
  b^1. Pileus on top decidedly truncate..... 10. *P. merrillii.*
  b^2. Pileus on top not decidedly truncate.
    c^1. Spores large, 12 to 14 μ long, 6.3 to 8.4 μ broad..... 13. *P. villatica.*
    c^2. Spores small, 5.4 to 7.5 μ long, 4.2 to 5 μ broad, 8.4 to 9 μ, long, 4 to 5 μ broad.
      d^1. Pileus white, smooth to floccose.
        e^1. Bulbous at base ..... 1. *P. abruptibulba.*
        e^2. Not bulbous at base..... 2. *P. arvensis.*
      d^2. Pileus colored, rough, covered with fibrils or scales.
        e^1. Mushrooms not deeply rooted.
          f^1. Pileus covered with fine, reddish fibrils..... 9. *P. luzoniensis.*
          f^2. Pileus covered with minute, brown scales.. 12. *P. placomyces.*
          f^3. Pileus silky, floccose or hairy-scaly..... 3. *P. campestris.*
          f^4. Pileus covered with large, sharp, pointed, brown scales. 6. *P. campestris* var. *ambrina.*
        e^2. Mushrooms deeply rooted.
          f^1. Pileus smoky gray, covered with sooty scales. 5. *P. campestris* var. *radicata.*
          f^2. Piles grayish, tinged with yellow..4. *P. campestris* var. *edulis.*

1. PSALLIOTA ABRUPTIBULBA Peck. Plate 1, fig. 1.

Psalliota abruptibulba PECK in Hard, Mushrooms (1908) 213; MARSHALL, Mushrooms (1905) 77; KAUFFMAN, Agar. Mich. 1 (1918) 237; KRIEGER, N. Y. Ste. Mus. Hdbk. (1935) 420.
Agaricus abruptus PECK, N. Y. Ste. Mus. Mem. 4 (1900) 201.
Agaricus silvicola VITTADINI in Atkinson, Mushrooms (1900) 22.

Pileus convex, later expanded-plane, dry, brittle, smooth, oftentimes covered with white, appressed, silky fibrils, at times with appressed scales, silky, shiny, white or creamy white, often with dirty-yellowish stains, 6 to 14 cm broad. Gills free, crowded to remote, narrow, white when very young, soon pink, then dark brown; edge entire. Stipe stuffed, later hollow, nearly smooth, cylindrical or tapering upward, sometimes slender, white to yellowish in age or when bruised, 8 to 16 cm long, 7 to 16 mm broad. Annulus thick, smooth, later cracking below, yellowish, evanescent. Spores smooth, elliptical, dark purple, 5.4 to 7.5 μ long, 4.2 to 5 μ broad. Flesh thick, turning yellowish in age or when bruised. Odor and taste pleasant.

LUZON, Manila, *Philip. Not. Herb. 1301, 1307, 1548 P. S. Gener.* On the ground among leaves under trees and in thickets.

2. PSALLIOTA ARVENSIS Schaeffer. Plate 1, fig. 2.

Psalliota arvensis SCHAEFFER in Kauffman, Agr. Mich. 1 (1918) 236; REA, Brit. Basid. (1922) 84; MCDOUGALL, Mushrooms (1925) 71; KRIEGER, N. Y. Ste. Mus. Hdbk. 11 (1935) 422.
Agaricus arvensis SCHAEFFER, Ic. Bav. 4 (1862) 72; Fries, Hym. Eur. (1874) 278; COOKE, Ill. Brit. Fung. 5 (1886) 523.
Agaricus exquisitus VITTADINI, Fung. Mang. (1835) 146.

Pileus fleshy, globose, conical to campanulate, later expanded, at first cottony to mealy, then smooth, somewhat shiny, white-gray, sometimes stained with yellowish to greenish shading, smooth to more or less chanelled, 7 to 14 cm broad. Gills strongly crowded, dry, round and free at the center, pale pinkish, then blackish brown; edge entire. Stipe stout, stuffed to hollow, glabrous, 4 to 18 cm long, 8 to 25 mm thick. Annulus thick, consisting of two layers, below more or less cracked, nearly persistent. Spores ellipsoid, smooth, purplish brown, blackish in mass, 8.4 to 9 μ long, 4 to 5 μ broad. Basidia clavate, 15 to 20 μ long, 4.5 to 5 μ broad.

LUZON, Rizal Province, Alabang, *Philip. Nat. Herb. 2751, 2791 J. M. Mendoza.* On the ground near army horse stables.

3. PSALLIOTA CAMPESTRIS (Linn.) Fries. Plate 2, fig. 1.

Psalliota campestris FRIES, Epicr. (1836) 213; Hym. Eur. (1874) 279; ATKINSON, Mushrooms (1900) 2; HARD, Mushrooms (1908)

307; REA, Brit. Basid. (1922) 87; KAUFFMAN, Agar. Mich. 1 (1918) 240; BRESADOLA, Icon. Myc. 17 (1931) 823; KRIEGER, N. Y. Ste. Mus. Hdbk. 11 (1935) 423; MENDOZA, Philip. Journ. Sci. 65 (1938) 82, 83.

Agaricus campester LINNÆUS in Saccardo, Syll. Fung. 5 (1887) 997; Fl. It. Crypt. Hym. (1915) 799.

Agaricus campestris LINNÆUS in Cooke, Hdbk. Brit. Fung. (1871) 137; FRIES, Syst. Myc. 1 (1821) 281; COOKE, Ill. 5 (1886) 528.

Pileus fleshy, white or brownish, at first hemispherical or convex, later expanded; margin nearly plane or recurved, often torn or fringed, extended beyond gills, smooth, silky-floccose or hairy-scaly, 5 to 14 cm broad or broader. Gills free, crowded, ventricose, at first pink, becoming chocolate to brownish or brown in age. Stipe white or nearly white, firm, bulbous when young, later almost equal, stuffed, somewhat smooth, squamulous, 4 to 10 cm long, 1 to 2.5 cm thick. Annulus white, fugaceous, membranaceous, sometimes in the form of a cortina, torn, sheathed middle. Spores broadly elliptical, purplish brown, 5 to 8 μ long, 4 to 6 μ broad.

Flavor and taste very pleasant.

LUZON, Rizal Province, Pasig, *Philip. Nat. Herb. 2614, 2623 J. M. Mendoza.* On the ground in rotting palay husk.

4. PSALLIOTA CAMPESTRIS (Linn.) Fries var. EDULIS Vittadini. Plate 2, fig. 2.

Psalliota campestris Fries var. *edulis* VITTADINI, Fung. Mang. (1836) 41; BRESADOLA, Icon. Myc. 17 (1931) 825; MENDOZA, Philip. Journ. Sci. 65 (1938) 83.

Agaricus campestris LINNÆUS in Adriano, Philip. Journ. Agr. 4 (1935) 2.

Pileus fleshy, globose, convex-expanded, often decorated with cracks which are sometimes longitudinal in form, white, tinged for the most part with yellow, 3 to 8.5 cm broad. Gills very crowded, sinuate to nearly free at the center, rosy white, at length dark brown. Stipe stuffed, stout, often abruptly tapering and rooted at base, concolorous with pileus, smooth, covered with minute scales above ring, 3 to 5 cm long, 1.5 to 2 cm in diameter. Annulus double, at first broad, later turned up, white, hairy, becoming smooth above, furrowed, membranaceous at base. Spores broad, ellipsoid, flesh to dark-colored, smooth, 7 to 8 μ long, 5 to 6 μ broad.

LUZON, Laguna Province, Los Baños, *Bur. Sci. 55646 F. Adriano.* On the ground in pastures.

5. PSALLIOTA CAMPESTRIS (Linn.) Fries var. RADICATA Vittadini. Plate 2, fig. 3.

Psalliota campestris Fries var. *edulis* VITTADINI, Fung. Mang. 11 (1835); BRESADOLA, Icon. Myc. 17 (1931) 827.

Agaricus argyrostictus COPELAND, Ann. Myc. 3 (1905) 144; BROWN, Minor Prod. Philip. For. 3 (1921) 132.

Pileus fleshy, hemispherical to subcampanulate, depressed when expanded, white, smoky gray, silky, covered at the center with adpressed, sooty scales, 6 to 11 cm broad. Gills free, from rosy to dark purple, round and free at back. Stipe stuffed with cottonlike substance, sometimes hollow, white, fibrillose, striated above annulus, tinged with yellow below, 3 to 6.5 cm long, 0.8 to 2 cm broad, about 3 cm in diameter at base. Annulus superior, not broad, white, substriate at first, later shaggy. Spores ellipsoid to ovoid, smooth, dark purple, 5 to 9.5 μ long, 5 to 6 μ broad. Basidia clavate, 23 to 32 μ long, 6 to 7.5 μ broad. Flesh white, pinkish near gills, compact in pileus, fibrous in stipe. Odor and flavor pleasant.

LUZON, Laguna Province, Los Baños, *Philip. Nat. Herb. 2072, 2124, Bur. Sci. 55905 J. M. Mendoza, Bur. Sci. 55789 E. Roldan:* Rizal Province, Alabang, *Philip. Nat. Herb. 2527, 2569 J. M. Mendoza.* On the ground among leaves under trees.

6. PSALLIOTA CAMPESTRIS (Linn.) Fries var. UMBRINA Fries. Plate 3.

Psalliota campestris Fries var. *umbrina* FRIES, Hym. Eur. (1874) 279; GRESADOLA, Icon. Myc. 17 (1931) 826; MENDOZA, Philip. Journ. Sci. 65 (1938) 83, 84.

Agaricus vaporarius VITTADINI, Fung. Mang. (1836) 42.

Pileus compact, fleshy, convex, subglobose, later plane, umbonate, at first covered with a thin layer of fine fiber which later becomes fringed, sharp-pointed, scalelike, 5 to 10 cm in diameter. Gills free, crowded, round at base, at first white, pale yellow to flesh-colored, later tobacco-colored to dark. Stipe stuffed, later slightly hollow, nearly equal, sometimes tapering toward apex, 3 to 6 cm long, 1 to 2.5 cm in diameter, color below similar to that of cap, sometimes later paler, covered with fine fibrils, later becoming smooth; white to lightly colored above, somewhat powdery on surface. Annulus white on upper portion, brown below, more or less lasting. Flesh white, pale yellow to faint brick-red. Spores broadly ellipsoid, dark, smooth, 6 to 7.5 μ long, 3 to 4.5 μ broad. Basidia clavate, 24 to 31 μ long, 6 to 8.6 μ broad.

Odor pleasant, taste agreeable.

LUZON, Rizal Province, Alabang, *Philip. Nat. Herb. 2484, 2485, 2495, 2524, 2525, 2594 J. M. Mendoza.* On the ground among leaves under trees and in thickets.

7. PSALLIOTA COMTULA Fries. Plate 4.

Psalliota comtula FRIES, Epicr. (1836) 215; Hym. Eur. (1874) 281; KAUFFMAN, Agar. Mich. 1 (1918) 244; REA, Brit. Basid. (1922) 90; BRESADOLA, Icon. Myc. 17 (1931) 833; MENDOZA, Philip. Journ. Sci. 65 (1938) 84.

Agaricus comtulus SACCARDO, Syll. Fung. 5 (1877) 1006; COOKE, Ill. Brit. Fung. 5 (1886) 536.

Pileus at first convex to nearly expanded, subumbonate, silky, creamy to grayish white, more or less tinged with yellowish spots on margin, 2 to 4 cm broad. Gills crowded, ventricose, round and free at center, flesh white at first, later smoky umber. Stipe nearly cylindrical, hollow, silky, pale or slightly stained with yellowish, 3 to 5 cm long, 2 to 5 mm thick. Annulus membranaceous, thin, whitish, easily disappearing. Spores smooth, elliptical, purple-brown, 4 to 5 μ long, 3.5 to 4 μ Broad. Flesh whitish, becoming ochraceous in age.

Odor not distinct, taste agreeable.

LUZON, Bataan Province, Lamao Agr. Exp. Station, *Bur. Sci. 55197 J. M. Mendoza:* Laguna Province, Mount Maquiling, *Bur. Sci. 55728 J. M. Mendoza:* Manila, *Philip. Nat. Herb. 1923, Bur. Sci. 55555 P. S. Gener; Philip. Nat. Herb. 2487, Bur. Sci. 55596 J. M. Mendoza.* Growing on the ground under trees and under banana plants.

8. PSALLIOTA DIMINUTIVA Peck. Plate 5, fig. 1.

Psalliota diminutiva PECK, N. Y. State Mus. Rept. 26 (1874) 59; KAUFFMAN, Agar. Mich. 1 (1918) 245; KRIEGER, Ste. Mus. Hdbk. 11 (1935) 425.

Pileus fragile, at first convex, later plane, sometimes depressed, white, tinged with gray, silky to filbrillose, fibrils forming pinkish, reddish-brown scales at center, paler and smooth at margin, 2 to 4.5 cm broad. Gills free, moderately crowded, thin, broad, ventricose; edge entire. Stipe whitish, equal or tapering upwards, sometimes nearly bulbous at base, later hollow, sometimes silky, 2.5 to 5 cm long, 2 to 5 mm in diameter. Annulus thin, narrow, whitish, more or less permanent. Spores elliptical, smooth, purple brown in mass, 4.8 to 6 μ long, 3 to 3.6 μ broad. Flesh thin, whitish.

Odor and taste agreeable.

LUZON, Laguna Province, Mount Maquiling, *Bur. Sci. 55728 J. M. Mendoza:* Manila, *Philip. Nat. Herb. 1264 P. S. Gener, Philip. Nat. Herb. 2501 J. M. Mendoza.* On the ground among leaves under trees.

9. PSALLIOTA LUZONIENSIS (Graff) comb. nov. Plate 6, fig. 1.

Agaricus luzoniensis GRAFF, Philip. Journ. Sci. § C 9 (1914) 235; BROWN, Minor Prod. Philip. For. 1 (1921) 132; MENDOZA, Philip. Journ. Sci. 65 (1938) 84.

Pileus fleshy, thick at center, thin at margin and covered with some remnants of veil, convex, later expanded, white, smooth and reddish brown at center, rest covered with fine reddish fibrils, 6 to 10 cm broad. Gills white when young, becoming dark brown in age, free, moderately broad, crowded, rounded at back. Stipe long, light brown, floccose above annulus; white, smooth to fibrous below, swollen at base, 12 to 20 cm long, 5 to 10 mm in diameter. Annulus membranaceous, permanent, well up on stipe. Spores elliptical, 5 to 5.5 μ long, 2.4 to 3.5 μ broad, dark brown in mass. Basidia clavate, 18 to 20 μ long, 4.5 to 5 μ broad.

Odor and taste pleasant.

LUZON, Manila, *Bur. Sci. 21661 P. W. Graff* (type in Philip. Nat. Herb.) ; *Philip. Nat. Herb. 2827 B. Reyes.* On the ground among leaves under trees.

10. PSALLIOTA MERRILLII (Copel.) comb. nov. Plate 7.

Agaricus merrillii COPELAND, Ann. Myc. 3 (1905) 27; New Sp. Philip. Edib. Fung. Govt. Lab. Publ. 28 (1905) 144; BROWN, Minor Prod. Philip. For. 3 (1921) 134; MENDOZA, Philip. Journ. Sci. 65 (1938) 85.

Pileus naked, fleshy, thick, often scaly, white, later brown, shiny, truncate, broadly round at apex when young, becoming plane in age, 8 to 12 cm broad. Gills free, round at back, numerously crowded, broad, nearly sharp at edge, at first salmon-colored, finally turning dark or blackish. Stipe whitish, later turning brown, stout, abruptly enlarged at base, somewhat contracted at upper portion, 9 to 11 cm long, 7 to 10 mm in diameter. Annulus easily torn, often just hanging, located high up on stem. Spores elliptical, uninucleate, dark brown in mass, with purplish tinge, 5 to 7 μ long, 3 to 3.5 μ broad. Basidia clavate, 13.5 to 18 μ long, 3.6 to 5.1 μ broad.

Color and taste pleasant.

LUZON, Laguna Province, Los Baños, *Bur. Sci. 55853 J. M. Mendoza:* Manila, *Philip. Nat. Herb. 1261, 1893, 2617, Bur. Sci. 55170 P. S. Gener, Philip. Nat. Herb. 2616 B. Reyes, Philip. Nat Herb. 2620 G. Edaño, Philip. Nat. Herb. 1269, 2618, 2624 J. M. Mendoza:* Rizal Province, Fort William McKinley, *Bur. Sci. 55578 J. M. Mendoza.* Growing on the ground under trees.

11. PSALLIOTA PERFUSCUS (Copel.) comb. nov. Plate 8.

Agaricus perfuscus COPELAND, Ann. Myc. 3 (1905) 28; New Sp. Edib. Fung. Govt. Lab. Publ. 28 (1905) 145; BROWN, Min. Prod. Philip. For. 3 (1921) 134; MENDOZA, Philip. Journ. Sci. 65 (1938) 85.

Pileus round when young, white to creamy, becoming brown to dark brown in age, early expanded, disc slightly depressed, covered with very fine scales, margin strongly appendaged, 2 to 6 cm broad. Gills free, crowded, rounded on both ends, pale pink when young, later pink, soon becoming brown to dark brown because of the color of the spores in mass. Stipe equal, firm, hollow, at first white, later assuming color of cap, 3 to 5 cm long, 3 to 5 mm in diameter. Annulus way up on stem, early disappearing. Spores elliptic, dark brown in mass, 6 to 7.5 μ long, 4.2 to 5.1 μ broad. Basidia clavate, 21 to 24 μ long, 6 to 6.6 μ broad.

Odor and taste pleasant.

LUZON, Bataan Province, Lamao Agricultural Experiment Station, *Bur. Sci. 55181 J. M. Mendoza:* Manila, *Philip. Nat. Herb. 1271 P. S. Gener, Philip. Nat. Herb. 2537, 2621 J. M. Mendoza:* Rizal Province, Alabang, *Philip. Nat. Herb. 2478, 2567 J. M. Mendoza;* San Juan Heights, *Philip. Nat. Herb. 1087 E. Basaca, Philip. Nat. Herb. 2792 B. Reyes;* Fort William McKinley, *Bur. Sci. 55600 J. M. Mendoza.* NEGROS, Occidental Negros Province, Silay, *Philip. Nat. Herb. 2622 M. Unson.* Growing on leaves and in other grassy places.

12. PSALLIOTA PLACOMYCES (Peck) Kauffman. Plate 6, fig. 2.

Psalliota placomyces KAUFFMAN, Agar. Mich. 1 (1918) 238; KRIEGER, N. Y. State Mus. Hdbk. 11 (1935) 426.

Agaricus placomyces PECK, N. Y. State Mus. Rep. 28 (1878) 40; SACCARDO, Syll. Fung. 5 (1887) 1003; ATKINSON, Mushrooms (1911) 23; MCDOUGALL, Mushrooms (1926) 70.

Agaricus manilensis COPELAND, Ann. Myc. 3 (1905) 28; New. Sp. Philip. Edb. Fung. Govt. Lab. Publ. 28 (1905) 145; BROWN, Minor Prod. Philip. For. 3 (1921) 134.

Pileus thin, fleshy, convex to campanulate when young, later expanded and plane, sometimes umbonate, covered with minute scales which are more dense towards center; whitish, becoming brown in age because of the color of the scales; 5 to 11 cm broad. Gills crowded, free, white, then pinkish, finally dark brown. Stipe smooth, whitish, bulbous; bulb stained with yellow, stuffed, then hollow, 6 to 11 cm long, 4 to 7 mm thick. Annulus way up on stem, thin, more or less flappy. Spores elliptical, smooth,

purplish brown, blackish brown in mass, 5 to 6.5 μ long, 3.5 to 4.5 μ broad.

LUZON, Rizal Province, Mariquina, *Philip. Nat. Herb. 2752, 2790 S. R. Capco and S. Chico.* On the ground among leaves under trees.

13. PSALLIOTA VILLATICA (Brond.) Bresadola. Plate 5, fig. 2.

Psalliota villatica BRESADOLA, Icon. Myc. 17 (1931) 829.
Agaricus villaticus BROND., Gr. Ag. (1829) 26; FRIES, Hym. Eur. (1874) 280; SACCARDO, Syll. Fung. 5 (1887) 999.

Pileus fleshy, globose to nearly ovate, later convex to plain, lurid to straw-colored, silky, at length covered with dark-tawny scales; margin hairy, extending beyond gills, 8 to 19 cm broad. Gills very crowded, white at first, then rosy flesh, later dark brown, blackening. Stipe solid, stuffed, base ventricose to nearly bulbous, tapering upward, concolorous with pileus, scaly to cottony, scales straw-colored to yellow, at length disappearing, 4 to 8 cm long, 1 to 2.5 cm in diameter. Annulus way up on stem, broad, smooth above, appearing yellow below because of the hairy to cottony ornamentation. Spores ellipsoid, apiculate, guttulate, light, dark purple to dark brown, 12 to 14 μ long, 6.3 to 8.4 μ broad. Basidia clavate, 24 to 31 μ long, 8 to 12 μ broad. Flesh white. Stipe when bruised ochraceous to brick-red.

Odor rather unpleasant, taste almondlike.

LUZON, Bulacan Province, Norzagaray, *Philip. Nat. Herb. 1355, Bur. Sci. 55889 P. S. Gener.* On the ground under trees.

ILLUSTRATIONS

PLATE 1

FIG. 1. *Psalliota abruptibulba;* × 0.75.
2. *Psalliota arvensis;* × 0.6.

PLATE 2

FIG. 1. *Psalliota campestris;* × 0.7.
2. *Psalliota campestris* var. *edulis;* × 0.9.
3. *Psalliota campestris* var. *radicata;* × 0.9.

PLATE 3. *Psalliota campestris* var. *umbrina;* × 0.8.

PLATE 4. *Psalliota comtula;* × 1.1.

PLATE 5

FIG. 1. *Psalliota diminutiva;* × 1.
2. *Psalliota villatica;* × 1.

PLATE 6

FIG. 1. *Psalliota luzoniensis;* × 0.7.
2. *Psalliota placomyces;* × 0.9.

PLATE 7. *Psalliota merrillii;* × 0.8.

PLATE 8. *Psalliota perfuscus;* × 1.5.

PLATE 1.

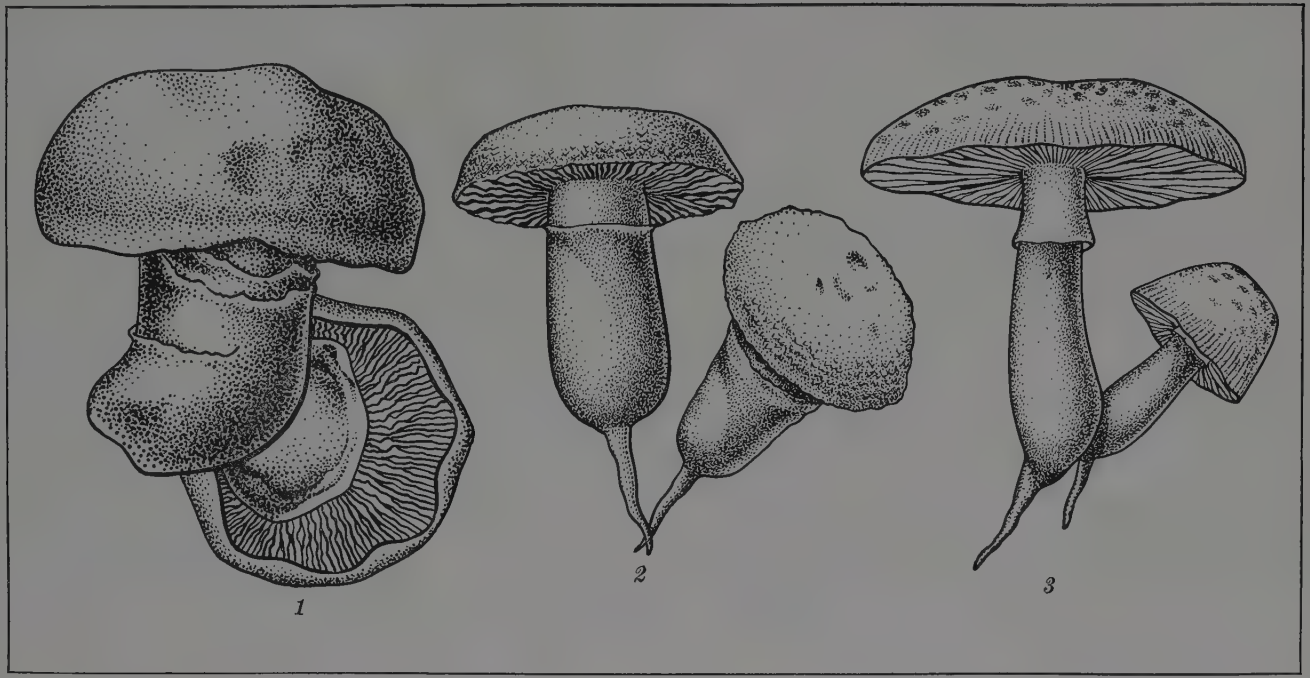

PLATE 2.

PLATE 3.

PLATE 4.

1

2

PLATE 5.

PLATE 6.

PLATE 7.

PLATE 8.

BOOKS

Books reviewed here have been selected from books received by the Philippine Journal of Science from time to time and acknowledged in this section.

REVIEWS

Dictionary of Scientific Terms as Used in the Various Sciences. By C. M. Beadnell. London, Watts & Co., 1938. 235 pp. Price, 1/-.

The need for a good English dictionary of scientific terms is only too apparent to the editor of a technical publication. In manuscripts sent to technical periodicals for publication, terms continually crop up that often not only are unfamiliar to the editor but are even unknown to many workers in the chosen field of the authors of these manuscripts. Standard dictionaries usually fail to give the necessary definitions of these terms, either because they do not contain them at all or because the usages given do not include the specialized ones required.

Unfortunately, the few attempts that have so far been made to meet this real need only tend to emphasize it. The present reviewer recalls with some sadness in this connection a German-English technical dictionary that does not include trade names of chemical compounds that have acquired general use in laboratories; a chemical dictionary is gathering dust on his shelf because it does not give abbreviations of chemical compounds. "A Dictionary of Scientific Terms" seemed to be the welcome answer to the needs of the present reviewer; it seemed so well arranged and seemed to cover such a wide range of technical matters that its perusal could not but inspire confidence; however, subjected to a practical test, it proved no less disappointing than, say, Webel's "Technical Dictionary, English and German," or Patterson's "German-English Dictionary for Chemists," for it failed to cover such common word as "enzootic," "zootic," "necrotic," or "alula."

Perhaps the most constant failing of dictionaries of this type is that they do not give complete terminologies of any particular field of science, but instead give a little of everything. Consulting them is still very much of a gamble, with the indifferent success of a housewife who rummages through her button box

in the hope of finding the right button to replace the one lost from her husband's shirt. Attempts made so far show the need, on the part of the compilers, of more intensive research in a properly limited field, rather than of extensive effort thinly spread over many fields of science.

Beadnell's book has the merit that it is moderately priced, of convenient size, small enough to be carried in a pocket or stuffed into a drawer, and that the definitions given are complete and thoroughly concise. But the technical dictionary editors and readers of technical publications are waiting for is yet to be written; perhaps it will at last come out of the pen of some editor who has spent several decades at the desk over the manuscripts of one of our leading scientific publications, and who has—a rare quality in editors—a mania for collecting, ordering, and filing pertinent data over a long period of years.—S. R.

The Forest Manager. A Handbook for Farm Woodland Owners and Others Who Manage Their Own Woodlands. By Dr. Karl Dannecker. American edition. Translated by Arthur O. Weidelich. Washington, D. C., The American forestry association, 1939. 172 pp., front., illus. Price, $2.

The "Forest Manager," written in German, has been made available to the English speaking peoples by Arthur O.Weidelich. Although intended primarily for private woodland owners, this book is equally valuable as a guide to managers or administrators of state-owned forests.

The intensity of forest management for the production of industrially useful forest products, particularly wood, is anywhere in inverse ratio of the existing forests. Thus Germany, where the total forest area is but one-fourth of the total area of the country, and 47 per cent of this forest area is privately owned, is foremost in the science and art of forestry. The Philippine forests cover approximately three-fifths of the total land area of the country, and out of this forest land only about 2.5 per cent is privately owned. Due largely to this fact the Philippines is still in what may be called the preliminary stage of intensive forest management. This book is of great interest to us because of the authoritative information it imparts as to the position of forests in the national economy and the part they play in our daily life.

Written in a language that can be readily understood, this book will be a good addition to every school library in the Philippines for the development of understanding and appreciation

of the value of forests, which are prerequisites of the institution of rational forest husbandry.—F. T.

Textbook of Meat Inspection. By J. Drabble. 2d. rev. ed. Sydney and London, Angus & Robertson, Ltd., 1938. 383 pp., illus. Price, 25/-.

The Textbook of Meat Inspection, by Drabble, is especially prepared for lay meat inspectors. It is divided into two parts. The first part deals with elementary anatomy and physiology and serves as an introduction for a beginner to a complete idea of the subject. It is an indispensable guide to meat inspectors in correlating the value of a knowledge of anatomy and physiology to pathological conditions. It contains a summary and a list of questions, after each chapter, that call to mind important facts relating to the topic discussed.

The second part of the book contains an extensive discussion on meat inspection, describing the procedure followed in the examination of live animals (ante-mortem examination) until the meat has been certified suitable for food. In this part is discussed the differentiation of the meat of different animals. The common pathological conditions encountered in meat inspection are described. Bacterial and parasitic diseases are fully discussed in clear, simple, but comprehensive manner, so that even the beginner in meat inspection can easily understand the information. The discussion on the circulatory and lymphatic system serves to elucidate the complicated avenues of infection which lead to the generalization of disease.

The last portion deals with staining methods and their uses in the diagnosis of diseases most commonly encountered in post-mortem examination.—J. J. B.

A Nutrition Manual. By Henrietta C. Fleck. Ann. Arbor, Michigan, Edward Brothers, Inc., 1938. 180 pp.

The information this manual conveys is presented in a series of questions and suggestions, arranged in an outline form. An interesting feature of the book is that the different topics are not discussed as in other books, but are presented as groups of problems for study and verification. The author refers the reader to books and magazines where correct data and information in connection with the subject under study can be obtained. All the problems touched upon in this book deal exclusively with the common aspects of nutrition in relation to the daily life of man. Every problem is treated in the form of questions, a list of references, and assignments of tasks to be performed.

The important feature of this book is that it stimulates the reader to search for a broader knowledge of some of the important and common aspects of nutrition. Among the problems presented are those which deal with the metabolism of food in the human body and the sources, chemical composition, and dietary values of the different food elements, such as carbohydrates, fats, proteins, inorganic salts, and vitamins. It serves as a good guide in planning an adequate dietary that is economical and beneficial and possesses high nutritive value. It includes correct meal planning for infant and child feeding and hospital dietaries. It offers the school authorities a program of health education among school children.

All the problems presented in this book are of vital importance to persons and institutions who are actively engaged in nutrition studies.—P. J. A.

Mineral Valuations of the Future. By C. K. Leith. New York, American Institute of mining and metallurgical engineers, Inc., 1938. 116 pp., Price, $1.50.

This book is intended more for the professional engineer than for the engineering student.

The author acknowledges that the basic principles involved in the physical valuation of mining property are still as important as ever, but he points out that there is a marked tendency among nations that are not selfsufficient in mineral wealth and can foresee the eventual exhaustion of their mineral deposits to pass laws which tend to affect the future values of their mining properties. Such factors as taxation, legislation, production and price control, labor organizations, tariff walls, changing trends of consumption on account of improvement in technic, and many other special measures designed to control national and international movements of minerals are discussed by him as indications of the present trend toward economic nationalism.

Professional engineers, therefore, would do well to read this book. The author admits that although these factors are intangible and immeasurable, they are nevertheless powerful enough to affect the future value of a mine, and the valuation engineer of the future should give them their proper weight if he is to give a true value of the mine.

Doctor Leith's discussion is backed by an enormous wealth of experience which he gathered in his capacity as technical consultant on minerals and geological matters of both national and

international importance. Any writing of Doctor Leith on these subjects is therefore at once authoritative and instructive.

—E. C. B.

Theory and Practice of Mine Ventilation. By William J. Montgomery. Columbus, Ohio, The Jeffrey manufacturing Co., 1936. 185 pp., illus. Price, $3.50.

Of the many books written on mine ventilation, the majority are highly technical in nature and directed principally to the attention of those versed in higher mathematics. This volume ably fulfills its purpose in giving a comprehensive idea of the fundamental principles involved in efficient mine ventilation to both the graduate mining engineer who has been unable to keep abreast of the subject and the practical mining man desirous of a more thorough knowledge and understanding of these fundamentals. Every angle of this vitally important subject is explained in a manner and language easily understandable. Although the book is written primarily for coal mining, those interested in metal mining would profit much by making a conscientious study of it.—G. H. M.

Nomenclature Zoologicus. In Four Volumes. Vol I, A–C. Edited by Sheffield Airey Neave. London. The Zoological Society of London, 1939. xiv, 385, 480 pp. Price, postpaid, 8 guineas.

As stated in the editor's preface, "This work constitutes an attempt to give as complete a record as possible of the bibliographical origins of the name of every genus or subgenus in zoölogy that has been published since 1758, the date of the 10th Edition of Linnæus' 'Systema Naturae,' up to the end of the year 1935." It is distinctly a labor of love. It was prepared in order to lighten the burden of systematists by providing them with a reliable and up-to-date index on generic names.—M. T.

Petroleum Development and Technology, 1939. Transactions of the American institute of mining and metallurgical engineers, 132. The American institute of mining and metallurgical engineers, New York, 1939. 625 pp., illus., tables, diagrs. Price, $5.

The "Petroleum and Technology 1939" published by AIME, is a complete symposium of papers and discussions presented before the Petroleum Division at San Antonio, October 5 to 7, 1938; Los Angeles, October 20 and 21, 1938; and New York, February 13 to 16, 1939. It treats primarily of drilling and production problems based upon the experience of various technical men in the oil industry throughout the world.

In this symposium papers relating to allied subjects are grouped together into chapters. Chapter I treats of engineering, describing methods used in solving production and drilling problems in individual areas. A complete description of the mud technique in Iran is given by the Resident Geologist, M. W. Strong, who touches on the chemistry of drilling muds as well as on the physical properties of the various subsurface formations and their effects on mud control. Core analysis is described by Howard C. Pyle and John E. Sherborne with special reference to permeability or fluid-passing capacity of a rock. The work was confined to core samples in calculating the fluid content. Bottom hole measurements in pumping wells are described by J. J. Jakosky, who describes the reflecting method by timing an impulse from the surface to the fluid level and return. Exploring drill holes by sample-taking bullets is described by T. Leonardon and D. C. McCann, who give the percentages of core recovery by their method and the use of the core samples when taken. There are also two abstracts given; one on acid treatment of limestones by R. E. Heithecker, and decline curve analysis by H. E. Gross. There are also two core analysis papers given, one by H. G. Botset on a method for determining the water content of sand, and another by A. B. Stevens, who describes a porosimeter for the determination of porosity by the gas expansion method.

Chapter II is devoted to engineering research. All of the papers describe the various problems in individual fields and the engineering methods used in solving them. The arrangement of the laboratory apparatus with figures describing it and the method of solving the production problems are shown. Tables, graphs, and mathematical formulas show the basis for the final conclusions.

Chapter III deals with petroleum economics. The papers deal with effective proration, economic equilibrium of refining operations, and the world consumption of petroleum and related fuels.

Chapter IV deals with production. It is divided into two parts, domestic and foreign. The domestic part gives production data in every state in which petroleum is produced. Tables showing the gravity of the oil, the average depth of individual fields, and the total production for the year enhance the usefulness of the book. In some cases a complete description of new fields is given. The second part of the chapter is devoted to foreign fields. It gives a resumé of new fields and geological

and production data of past producing fields. At the end of this chapter is an estimate of world reserves given by V. R. Garfius and R. V. Whetsil.

Chapter V gives a review of Refining Engineering for 1939 by Walter Miller. It describes the new equipment and new refining processes.

An index completes the book.—G. W. C.

Major Endocrine Disorders. By S. Levy Simpson. London, John Bale medical publications, Ltd., 1938. 184 pp., illus. Price, 10/6d.

This book is a profusely illustrated compendium of endocrine disorders. The author has successfully presented in 184 pages the points most useful for the recognition, understanding, and treatment of the results of the diseases of the endocrine bodies in the light of their known or generally accepted functions. He has avoided lengthy discussions on controversial topics, but his succint and clear presentation of opposing views as well as of his own is satisfying.

For the student of the normal and abnormal functions of the endocrine bodies, this book furnishes an up-to-date summary of the present knowledge of the physiology of these glands.—E. B.

The Wheel of Health. By G. T. Wrench. London, The C. W. Daniel company, Ltd., 1938. 146 pp., front. Price, 6/-.

Doctor Wrench approaches the study of health by the study of a very healthy people. The Hunza people of India have achieved a reputation for their strength, agility, longevity, and endurance unsurpassed by the people of any modern nation. A study of their environment, method of living, and diet shows no radical difference in these factors of health from those enjoyed by neighboring peoples; yet, a comparison of the physical and mental qualities of the Hunza with those of his neighbors proves the Hunza superior. By minute inspection and close study of the Hunza people Doctor Wrench has discovered that, in common with other healthy peoples, "the Hunza have attained environmental wholeness of which a whole diet is the vital factor, and that a whole diet means not only the right sort of foods but their right cultivation as well." In his inimitable manner, Doctor Wrench proves that food and its right cultivation are responsible for the excellent physical and mental well-being of the Hunza.

By checking his findings against the results of the experiments of Sir Robert McCarrison, McCollum and Simmonds, Sir Albert Howard, the experiments of the Dutch during the World War,

and the findings of agriculturists and others, Doctor Wrench proves that health is attainable by right diet and the proper cultivation of foods; that is, by respecting the Wheel of Health which is essentially from man to soil, from soil to plant, from plant to man.—H. L.

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Modern sewage disposal. Anniversary book of the Federation of sewage works associations. New York, Federation of sewage works associations, 1938. 371 pp., illus. Price, $3.50.

NOBLE, L. H., and R. B. EVERILL. From forest to woodworker. Milwaukee, The Bruce publishing co., 1938. 252 pp., ilus. Price, $1.75.